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The organization of this Society was the result of a constantly growing interest in the study of the history of science. In 1919 a group of scholars interested in the cultural phase of science, under the direction of Dr. Lynn Thorndike, formed a section of the American Historical Association. In 1920 a similar section was organized in the American Association for the Advancement of Science, with the late Dr. William A. Locy as chairman. The formation of The History of Science Society by Dr. David Eugene Smith was the result of the merging of these two groups. The need of an organization of this kind was evidenced by the rapid recognition accorded The History of Science Society. It was organized in Boston, January 12, 1924, and was incorporated under the laws of the District of Columbia, January 30, 1925. It was affiliated with the American Association for the Advancement of Science, April 26, 1925, and admitted as a constituent member of the American Council of Learned Societies, February 2, 1927. The Society meets annually, usually with the American Association for the Advancement of Science or the American Historical Association, and participated actively in the Second International Congress of the History of Science and Technology in London in 1931.

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SUMMARY
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Second Preface to the Nineteenth Volume of Isis
(Beirût)

During a sleepless night in Athens last May it occurred to me—and the thought tormented me—that a scholar has only done a part of his duty, and perhaps not even the best, when he has published the honest and austere report of his investigations. Unless he were a graceless pedant he could not complete his task without learning much which is beyond its scope, and is he not bound to reveal his vision, or at least to indicate it in order that others may be led to it? My fellowmen may rightly say to me: "What are you doing? You are writing unreadable books for a very few scholars. Is that all? Do you feel that this justifies your life? You could accomplish nothing without being freed by us from other activities. Think of your opportunities. Do you deserve your leisure? Are you even with us? Have you no message for us?"

Such thoughts come back to me with painful reiteration day after day, and how can I escape them, being as deeply conscious as I am, of my continual and endless dependency on the service and love of other men? How shall we determine the extent of our own service? In fact we ourselves are the arbiters of our debts and the bigger we are the more we owe. The mean pay very little and the generous very much, but nobody can ever be cheated except by his own parsimony, for in the last analysis everyone pays and receives what he is worth.

We are now, my wife and I, on our way home after a long journey in the Arabic and Muslim lands around the Mediterranean Sea. During the last fourteen months I have seen so many things —most of which were new to me—that it will take me years of reading, study, and meditation to assimilate my new knowledge. What might be called the scientific results of my journey will

appear by and by in my *Introduction* and in *Isis*. Even as to-day and for as long as I may live, some of the notes I am using in my writings were collected by me more than twenty years ago and were buried during the war in my Wondelgem garden—I recognize these at once because of the peculiar script and paper—: even so from now on I shall have abundant opportunities of weaving into my writings reminiscences of this oriental " Wanderjahr." But these scientific results are not the only results of such a journey, nor perhaps the most important. Some impressions which could not be stated in scientific language—and may be which could not be expressed at all except in an oblique or roundabout way, are nevertheless fundamental because they will color my every thought and have already become a part of my substance.

Where am I now? On board of a big ship crossing the Atlantic, or sitting under a carob tree watching the blue Mediterranean and the snow capped Lebanon and pondering in my mind eternal commonplaces. A white mule which hauled many carloads of lumber uphill is now browsing contentedly nearby. Surely she has earned her luncheon and her rest, but have I? What is the purpose of life? If I were better than I am should I ask the question? For the answer is very simple: the purpose is given and measured by our devotion; it cannot be given or measured otherwise. Life is meaningless only for the undevoted.

The time of our journey was in a way unfortunate because of the stubborn political and economic crisis which was creating discomfort and disillusion all over the world and covering everything with a veil of melancholy. People who would normally have laughed were grave; gayety everywhere was tempered with fear, and there was too much anxiety and distress around every corner for anybody to be careless and free. Yet one has perhaps a better chance of knowing people when one sees them in their darker mood, and when untoward events induce them to retire within their own hearts and to express more simply their deeper selves.

The outstanding event of my journey is the rediscovery and confirmation of the abundant goodness of the men and women of our time. The traveller, be it noted, is not always well placed to make such a discovery, because the people who cater to him

and who form necessarily a large part of his acquaintance, are often prone to consider him a legitimate prey and hence do not show themselves to him in their best light. Yet in spite of this obvious drawback I was overwhelmed time after time by the kindness which was bestowed upon me by people of all kinds, high and low, rich and poor, intelligent and foolish, learned and ignorant. And I could not help wondering: Why are those people so kind to me who am nothing to them? They see me to-day and they know that to-morrow I shall have vanished. They give, and they know that I cannot give anything back except a friendly glance or perhaps a handshake and a few broken words. Is that little enough to make them feel how much I appreciate their brotherliness? Why are they so kind to me?—Because they are kind and perhaps also because I am.

But the kindnesses shown to me, however abundant, are of little account as compared with those of which I was not the recipient but only the silent witness. We must not forget that the essential goodness of man is often eclipsed especially in troublesome times because their political leaders—whether constitutional or insurrectional—can so easily intimate peremptory orders involving infinite cruelty, injustice and misery. Yet what unlimited treasures of charity there must be in men and women that they are able to replenish their hearts from it continually in spite of the criminal efforts of the little band of ambitious wretches who can think only of personal, sectional or sectarian aggrandizement. A state of war is artificially created and innumerable people are at once tricked into murderous activities in the name of everything holy. This means that people are weak and foolish but not that they are bad, for as soon as the war is over and in spite of the clever maneuvers of the hatred mongers, they are ready to fraternize and help one another. How good man must be, deep within him, to resist with such buoyancy the intolerable pressure of sectarianism, fanaticism, commercial competition, greed, lust of power, and martial spirit. How strong must the centripetal forces of humanity be to overcome the centrifugal activities which never relent.

The traveller enjoys the beautiful spectacles of nature, and those equally beautiful and even more impressive due to man's cunning, but what could be more enjoyable than the smiles of

good men and good women, and these greeted us at every corner. And how pleasant it was to witness so many examples of helpfulness, not only in a few places but almost everywhere, in godforsaken places across the desert as well as in the heart and slums of great cities. Of course in the latter one expected to find considerable misery and vice because the poverty is nowhere deeper than in the shadow of wealth and because the city lights attract the worst elements of the land as well as the best. Everything is intensified by the stimulations of urban life, the good is made better, and the evil worse. The lower depths of oriental towns are unspeakably low, and yet how much goodness one could still find in the vilest quarters.

Thus far I have spoken only of individual goodness which is the fundamental thing, but the Western world gives us also abundant examples of corporate and organized goodness, and this is perhaps its chief glory and its main justification. The creation of beautiful things which multiply the joy of living, and the discovery of additional parcels of truth which improve our understanding and our efficiency—to be sure these are great achievements, but not quite as great I believe as the steady and heroic struggle which is carried on to alleviate the sufferings and ignorance of the people and to increase their health, their freedom, and their happiness. Thousands and thousands of men and women are engaged in a constant warfare against superstition, prejudice, iniquity, disease, and misery. The struggle is gigantic and the progress slow and sometimes interrupted by a standstill or a temporary backset, but the workers are indefatigable and for one who dies or fails, two or three new ones offer their devotion.

It is in this respect that the West scores upon the East, and scores heavily. The people of the East may be as wise as ourselves, and man for man they may be quite as good or better, but they lack the scientific spirit which characterizes the Western world of to-day, and largely because of this they also lack the spirit of organized charity, of cooperation, and social service. There are of course instances of organized philanthropy in the East, but barring those whose purpose is sectarian or nationalistic, these organizations are almost always of Western origin and substance. It is not too much to say that outside of the religious bonds, the brotherly structure holding the East together—and

often holding it up against the West—has largely been built by people of the West.

One of the most admirable examples of Western philanthropy in the Near East has been given for more than half a century by the American University of Beirût. Originally started as a missionary college it has abandoned its sectarian purposes and is now devoted exclusively to the spreading of knowledge and truthfulness, earnestness and morality in its geographical sphere which includes not only Syria but a great part of the Arabic world. No attempt is made to promote any special Christian faith, or even Christianity itself, except that sublime part of it which is the patrimony of the whole of mankind. The purpose is so broadly human that people who are unable to conceive disinterested efforts (there are such people) cannot help wondering what it may conceal. I discussed the matter with the surgeon of an Italian ship, who was convinced that the American University of Beirût was a center for American propaganda and could hardly believe me when I stated that neither that institution nor any of the many American philanthropies in the Near East had ever received (or thought of receiving) a subsidy from the American government. Inasmuch as the French and Italian schools have always been subsidized and been rightly considered instruments of the French or Italian national aspirations, it seemed to him a foregone conclusion that the A.U.B. was also an advance agent of American imperialism in the East. In reality the A.U.B. derives its means from an endowment, from the tuition fees of students and from the annual subscriptions of its friends, most of whom are Americans living in America. These friends however are not entirely disinterested, for they believe that investments in pure philanthropy are the safest investments of mankind.

The A.U.B. is established in one of the most beautiful sites I have seen anywhere, on a hillside overlooking the blue Mediterranean and the city of Beirût with a magnificent view of the lofty Lebanon in the distance. Its grounds are covered with stately cypresses and all manner of beautiful trees and flowers. To live there, either as a student, a teacher, or a guest, is in itself an inspiration, but the unequalled loveliness of the site is still enhanced by the brotherly spirit which dwells in it. The otherworldliness of the missionary college is almost gone—alas ! this

could not be helped—but there still remain and will ever remain, I am sure, stronger feelings of cooperation, friendly emulation, self-help, and mutual helpfulness than it has been my privilege to experience anywhere else. This is especially striking in the Eastern atmosphere so redolent of suspicions and jealousies.

The A.U.B., and especially its medical school, is growing fast and the administration of it becomes every day more complex. This means that the organized charity which informs the whole organization needs more and more to be supplemented by the individual charity of the leaders and every member. The present leadership is all one would wish it to be, but the ever waxing technical needs of the institution are not always easy to reconcile with its spiritual needs. The old missionary college insisted primarily on the goodness and piety of its members; a university, a medical school, must pay special regard to their technical qualifications. This introduces inevitably a serious danger of backsliding. Yet thus far the A.U.B. seems to have triumphed over these increasing difficulties, and to have proved that an institution can remain brotherly and generous without being out of date or sectarian, without nursing religious or political afterthoughts, —in short, that it can preserve the best of the missionary spirit without its bigotry. Goodness and brotherliness for their own sake, beauty for its own sake, truthfulness for its own sake—we should all be able to unite on such a basis and the more so that we remain free and are indeed encouraged to build upon it as many other aspirations as we please.

The history of the world might be summed up as a continual struggle between light and darkness, between beauty and ugliness, between good and evil. This struggle is so obvious and so continuous that we can understand the dualistic philosophy of the Iranians and other peoples and the strange delusions of our own forefathers who found it almost as easy to believe in a personal devil as in a personal God. The fight is going on all the time, but I think that we are gaining ground, however slowly. In fact I have given a partial proof of this in the first two volumes of my *Introduction* and that proof will be completed, as much as it can, in the ulterior ones. We are gaining ground steadily but there is no chance of respite, for we would backslide just as soon as we stopped to resist the powers of darkness. It is

like the struggle of the husbandman against the weeds of his garden; he can never hope to eradicate them forever and they would take immediate advantage of his every weakness. Is it not better so? Who would wish for a perfect world leaving no scope for activity? Perfect enjoyment is a contradiction in terms. Perfection is our goal, but it can never be our dwelling place. Let us continue our fighting march toward it and come nearer and nearer to it, but we could not actually reach it without breaking at one and the same time the desires of our heart and the springs of our life.

Organized goodness must be so arranged that it does not discourage but stimulates individual goodness. It must be as personal as is compatible with efficient administration; it must never cease to invite individual correction and competition. The A.U.B. has gone a long way to realize these conditions; its missionary ancestry has perhaps made this more easy and natural, yet one must bear in mind that every year relaxes the contact with the missionary beginnings and that the pioneers are gradually removed from the scene. We must foresee the time when the old missionary spirit will cease to act as an invisible ferment. Some means must be found of replacing it and of stimulating the generosity and the fervor of the new workers.

At any rate there is no danger yet, and if I remember with joy the corporate goodwill of the A.U.B., I feel even more joy in recalling to my mind the abundant signs of the individual kindness of its members. These signs were given to my wife and myself with such abundance that I was ashamed of my own unworthiness and of my own inability to return them as unequivocally as I would have wished. However, I now realize that it is better that my Beirût friends remain my creditors. My heavy and precious debt I shall not repay to them but to others—to strangers—and thus the circle of their kindness will be somewhat enlarged.

And I remember—these also being the choicest fruits of my journey—the many good men and women I passed on the roads of the Near East, Southern Europe and Northern Africa. I wish I could thank personally each person who made me a little richer with a friendly glance, or refreshed me when I was tired with an ingenuous and confident smile. I wish I could thank

the unknown men and women who helped me with their hands, with their lips, or with their eyes, and whose heart met my heart, if only for a glimpse, and answered it.

There are many good men and women, most of them obscure, but, whether known or not, or however unknown, it is thanks to them that the world becomes gradually better and more beautiful, and life more precious. For each of them increases the world's virtue and beauty. All that is needed is to unite them and thus to manifold their individual power. In the meanwhile let each of us add his own infinitesimal weight into the right scale, and thus we shall be able to count a little as our own the victory and the advance. What greater happiness could we wish for?

We speak of peace but what do we do to achieve it? The least that everyone, and that is also the most that most of us, can do is to be kind to others, truthful and trustful. If we fail to do that, all our talk of peace and moral progress is nothing but cant.

Christmas is still far away, and I am writing this message in the middle of the Atlantic (1) far away from my friends (except the few who are travelling on the same ship), yet I think of them most vividly, and I anticipate the joy which Christmas will give me of expressing my friendship again at least to some of them. This is my Christmas message to them. When they read it Christmas will long be passed, but that does not matter—What a privilege to be thus linked and to form a chain of mutual and outward devotion, a chain of strength in a chaotic world,—a Golden Chain.

RMS. Laconia (Cunard) GEORGE SARTON.
Sept. 22, 1932.

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(1) To be more precise, about lat. N 49° and long. W 45° !

Lavoisier's early work in science 1763-1771

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INTRODUCTION (*)

The year 1768, in which LAVOISIER reached the age of 25, is important in his career. In that year he became an official of the *fermes*, he was admitted to the *Académie des Sciences* and

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(*) ABBREVIATIONS

Berthelot BERTHELOT, *La Révolution chimique ; Lavoisier*, 1890.
Grimaux GRIMAUX, *Lavoisier 1748-1794*, 1888.
H.A.R.S. *Histoire de l'Académie Royale des Sciences.*
I.O.S. *Introduction aux Observations sur la Physique, sur l'Histoire naturelle et sur les Arts*, ed. by ROZIER.
Kopp KOPP, *Geschichte der Chemie*, 4 vols., 1843-47.
M.A.R.S. *Mémoires de l'Académie Royale des Sciences.*
O.L. *Œuvres de Lavoisier*, 6 vols., 1864-93.
O.P. *Observations sur la Physique, sur l'Histoire naturelle et sur les Arts*, ed. by ROZIER.
R.A.R.S. *Registres de l'Académie Royale des Sciences.*

he commenced his work upon the nature of water. From his income as an official he could meet the costs of experimental work. His admission to the *Académie des Sciences* was a recognition of the work that he had done. He proceeded forthwith to prove that his zeal for science was constant and active.

I propose to consider the scientific career of LAVOISIER in the first stage, that is, before his admission to the *Académie des Sciences* and a few years after. I am to touch upon the later stages in so far as he resumed in them his early subjects and methods of work.

LAVOISIER made the claim, towards the end of the year 1773, that he had been working at science for more than 10 years (*O.L.*, 1, p.439). He began in the year 1763. Some of his early subjects of work dwindled in interest as he proceeded with them : his activity diminished as if his feeling was that they were worked out. I take the first stage to have ended in the year 1771 because he took up work of a new kind in the year 1772.

LAVOISIER's early work has not received the attention that it deserves. For instance, M. ÉMILE MEYERSON, in certain brief notes on LAVOISIER's career, mentions first his wealth and social position and second his admission to, and advancement in, the *Académie des Sciences :*

> " LAVOISIER enjoyed... an income that was very large for that epoch.... His great social influence was another notable advantage in the same direction. He became " adjoint " at the *Académie des Sciences* in 1768, at the age of 23 (1), when he had hardly begun to concern himself with science, " associé " in 1772, that is, well before the commencement of his great investigations and, finally, " pensionnaire " (which was the highest grade) in 1778, at a time when chemists did not at all understand the drift of his work " (*De l'Explication dans les Sciences*, 1921, 2, p. 890).

There is a censorious note in all this. M. MEYERSON suggests that LAVOISIER, in early life, did no scientific work that is worth considering, that his position in the *Académie des Sciences* was not justified till years after he was admitted there and, altogether, that his admission to, and career in the *Académie des Sciences* are to be accounted for on other than scientific grounds.

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(1) LAVOISIER was born on the 26th August, 1743; he took his place at the *Académie des Sciences* on the 1st June, 1768, that is, about 3 months before completing not his 23rd but his 25th year.

Many men pass their lives in the enjoyment of wealth and of social position without being admitted to membership of any learned society: most of them—I regret to say it—will have nothing to do with learning of the higher kinds. LAVOISIER was eager to be a member of the *Académie des Sciences* because he was aiming at distinction in science.

LAVOISIER's career was not made to the detriment of more deserving or of equally deserving chemists. Chemistry was moribund then in France. "La Chymie," VENEL said, "est peu cultivée parmi nous" (*Encyclopédie*, 1753, 3, p.408). How was the *classe des chymistes* at the *Académie des Sciences* constituted in the year 1768? The *pensionnaires* were LA CONDAMINE, BOURDELIN and MALOUIN; the *associés*, MACQUER and ROUELLE; the *adjoints*, CADET and BARON. Three of these, namely, MACQUER, ROUELLE and CADET have some significance in eighteenth century chemistry; the others are negligible.

A vacancy having arisen, owing to the death of BARON, JARS and LAVOISIER were admitted together as *adjoints*. The cardinal things were not wealth and social position. JARS, who was doubtless a worthy man, was admitted because he had the support of a minister of state, LAVOISIER because the *Académie des Sciences* knew the work he had done and deemed him a man of promise. He had submitted to it an essay and four memoirs, all of which disclose his ardour for science. Those academicians, who had seen and heard him, knew that he was in earnest. Some of them, GUETTARD in particular, had an intimate knowledge of his work.

LAVOISIER is mentioned in the minutes of the *Académie des Sciences* for meetings that were held in May and June, 1768. NOLLET and MACQUER, on the 11th May, read a Report, lengthy and laudatory, on one of his memoirs; a week later they read another Report, of a similar kind, on another of his memoirs. In the first they declared:

> "Son mémoire est celui d'un homme qui a beaucoup de connaissances physiques et qui les employe avec une grande sagacité" (*R.A.R.S.*, 1768, May 11th, p.76 v.).

That was a declaration of his fitness for admission to the *Académie des Sciences*. At the meeting on the 18th May, he and JARS were nominated to fill the vacancy, he by the larger number of votes and JARS by the smaller.

The minister of state, to whom these nominations were forwarded, submitted them to the King and obtained a decision. From the letter which he sent to the secretary of the *Académie des Sciences* it appears that JARS was preferred as being the older man and as having worked for the State. At the same time, by an exceptional arrangement, respect was manifested for the recommendation of the *Académie des Sciences*. LAVOISIER, known as "a very distinguished subject," was to be an additional "adjoint chymiste."

At a meeting of the *Académie des Sciences*, held on the 1st June, first the secretary read the minister of state's letter and next JARS and LAVOISIER took their places. The secretary's minute of these proceedings begins with the letter:

"J'ai, M. rendu compte au Roy de l'élection faite à l'Académie le 18 de ce mois pour remplir la place vacante par la mort de M. BARON. Sa Majesté a mis en considération que le nombre des voix pour MM. LAVOISIER et JARS étaient presquégales que cependant le S. JARS était beaucoup plus âgé que le S. LAVOISIER et que d'ailleurs il a été employé dans plusieurs circonstances par ordres de sa Majesté pour des objets intéressants a Son Service et même a l'État. Sa Majesté a jugé à propos de le choisir pour remplir la place vacante et attendu que le S. LAVOISIER est aussi un sujet très distingué Sa Majesté l'a pareillement nommé pour être dès à présent adjoint dans la même classe et lorsqu'il viendra à vaquer une autre place dans cette classe il n'y sera point fait de nouvelle élection. Vous voudrez bien informer l'Académie de cette disposition de Sa Majesté.

" Après la lecture de laquelle MM. JARS et LAVOISIER ont pris place" (*loc. cit.*, June 1st, pp.109 r.-109v.).

PART I

(i) Lavoister's training in science

One wants to know what training LAVOISIER received in science —particularly in physics and chemistry—who were his teachers and what influences are perceptible in his early work.

The eminence of France in science, at that time, depended more upon mathematicians and astronomers than upon physicists and chemists. The subject of physics was not adequately recognised. Physicists, as such, were not admitted to the *Académie des Sciences*. I cannot find that the French physicists were doing or even aiming at anything substantial. Under the stimulus, which was felt throughout Europe, that FRANKLIN had

given they worked at electricity without making much progress. Physics, as an applied science, was cultivated by the astronomers throughout Europe : a training in making physical measurements could be obtained in the astronomical observatories and, I suspect, hardly anywhere else.

It is known that LAVOISIER was a pupil at the *Collège Mazarin* and that he attended courses in science at the *Jardin des Plantes*.

About the *Collège Mazarin* and LAVOISIER, taken together, the information is meagre and unsatisfactory. GRIMAUX reports that there were organised courses in science at that college—whatever that may mean—and that LAVOISIER had numerous successes and obtained a second prize in rhetoric—thereby suggesting that he did not gain the highest distinction in any subject (*Grimaux*, p.3, text and footnote).

It is known that DE LACAILLE (2), the astronomer, was the professor of mathematics at the *Collège Mazarin :* that he had an observatory there; that he published books on mechanics and optics. Hence LAVOISIER learnt mathematics from him, possibly also mechanics, optics and astronomy; possibly made observations, under his guidance, in astronomy and meteorology.

LAVOISIER learnt botany from DE JUSSIEU (3) at the *Jardin des Plantes* and accompanied him on botanical excursions (*Grimaux*, p.4). I do not find that he took a deep interest in that subject or ever cited in a memoir the name of his teacher.

LAVOISIER attended ROUELLE's course of lectures in chemistry at the *Jardin des Plantes* and, I suppose, worked in his laboratory. ROUELLE (4) was demonstrator in Chemistry at the *Jardin des Plantes* for 26 years (1742-1768). As an investigator he is known for his work on salts : he classified salts according to the shape of the crystals, gave an improved definition of a salt and brought the existence of acid salts into notice. He gave much less attention, however, to investigation than to teaching. His course of lectures on chemistry, which was illustrated by experiments in abundance, attracted large audiences, year after year. People liked and respected him : he was eccentric, enthusiastic, awkward

(2) NICHOLAS LOUIS DE LACAILLE (1713-1762).

(3) BERNARD DE JUSSIEU (1699-1777).

(4) GUILLAUME FRANÇOIS ROUELLE (1703-1770). He was the elder brother of HILAIRE MARTIN ROUELLE (1718-1779).

and sincere. DIDEROT attended his course three times in succession and afterwards wrote of him in the highest terms. By his teaching he exerted an influence on chemistry in France. In addition to LAVOISIER he taught VENEL, CADET, MACQUER, BAYEN, MONNET, DARCET, ROUX, BUCQUET. VENEL, in the *Encyclopédie*, constantly cited his judgments.

LAVOISIER's early work shows the influence of DE LACAILLE and of ROUELLE to a limited extent: it shows the sustained influence of GUETTARD and the stimulus of DÉPARCIEUX and of LEROY. Later I shall say more of these three men. For the present it is sufficient to say that none of them was a teacher by profession.

(ii) Meteorology

Sometime in the year 1763 LAVOISIER commenced with Meteorology, in a humble way, as DALTON did afterwards, by making daily observations of a barometer and a thermometer. He was acting, I suppose, under the influence of DE LACAILLE. He made a record of an *aurora borealis* that he saw at Villers-Cotteret on the 24th October, 1763 (*O.L.*, 4, pp.1-7). That record, probably, is the earliest document of his, complete and scientific, that we have. His intention to make it scientific and complete is obvious. He began by giving the latitude and longitude of the place and he described the aurora, in detail, during the 2 1/2 hours that it lasted. He observed its place in the sky with reference to the stars. He wrote notes in the field by the light of the moon. Having gone to the house and seen that the aurora had become more brilliant than ever he returned to his place of observation. This time he had with him a mariner's compass, which he used in making observations, and also a lantern by the light of which he made further notes. He saw another aurora, at Rheims, on the 24th October, 1769, of which he submitted an account to the *Académie des Sciences* (*H.A.R.S.*, 1769, 72).

LAVOISIER's interest in Meteorology widened and deepened, he took part in standardising thermometers and barometers: he collected observations from numerous correspondents. One of

his purposes was to ascertain the laws that underlie the changes in the atmosphere. With that in view he had barometers constructed, verified and distributed to observers, all at his own cost : one of these barometers was sent to an observer at Baghdad (*Grimaux*, p.6). Towards the end of his life he drew up a set of instructions for enabling ordinary people to predict the weather from the variations of the barometer. He then made the suggestion that a set of weather predictions should be issued every morning (*O.L.*, 3, pp.765-71).

Appendix

Lavoisier on Meteorology (5)

1. *Observation d'une aurore boréale faite à Villers-Cotteret le 24 octobre* 1763 (*O.L.*, 4, pp.1-7); *à Reims le 24 octobre* 1769 (*H.A.R.S.*, 1769, 22).

2. (i) *Rapport sur un effet singulier du tonnerre* (*I.O.P.*, 1772, 2, 310-2; *O.L.*, 4, pp.488-90). (ii) *Rapport sur des effets singuliers du tonnerre* (*M.A.R.S.*, 1789, 613-6; *O.L.*, 4, pp.491-4).

3. *Le froid de* 1776 (*op.cit.*, 3, pp.349-420).

Note. This is a collection of documents with each of which LAVOISIER was concerned and some of which he wrote.

4. *Thermomètre des Caves de l'Observatoire. Précautions prises pour construire et pour graduer ce thermomètre* (*op.cit.*, pp.421-6).

5. *Mémoire sur la construction des baromètres à surface plane* (*op.cit.*, pp.753-8).

6. *Observations météorologiques. Baromètres* (*op.cit.*, pp.759-64).

7. *Règles pour prédire le changement de temps d'après les variations du baromètre* (*op.cit.*, pp.765-71).

8. *Rapport sur la construction du baromètre*, by LEROY and LAVOISIER (*op.cit.*, pp.525-7).

9. Various Notes : *op.cit.*, pp.15-6; 40-5; 390-1; 402-4.

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(5) I draw attention to the following reprint : *Extraits des Mémoires de Lavoisier concernant la Météorologie et l'Aéronautique publiés par les soins de l'Office national de France*, Paris, 1926.

(iii) Lighting

In the year 1764 a Prize was offered, through the *Académie des Sciences*, for an Essay on the subject of lighting a city at night. This offer led to no good result; it was renewed in the following year and the value of the Prize was doubled. LAVOISIER, on the first occasion, began work and stopped; on the second occasion he worked with determination. He submitted an Essay and, later, a Supplement in the competition for this Prize.

MILTON stated the position of all seekers after knowledge, whilst they are beginners, in what he said about Adam and Eve when they had to leave the Garden of Eden: "the world was all before them where to choose." LAVOISIER, eager to make a career in science, was troubled in choosing a line of action. That is what the Essay indicates:

> "When nothing stimulates the working of the mind, when there is nothing to direct its attention to any definite object, often, in an aimless course, it wanders and goes astray; its slow and delayed products perish before they have seen the light of day" (*O.L.*, 3, p.1).

The Prize gave him something definite to aim at.

LAVOISIER made a beginning, in 1764, with "observations on the substances that one can burn with most advantage and on the best arrangement of wicks and reservoirs." In 1765 he formed a better plan of action: "calculations, physical and chemical experiments, theory linked with practice, that is what the programme of the Academy seems to demand" (*op.cit.*, p.2).

I find in this Essay strong indications of the wide outlook, the capacity for public affairs and the energetic action that LAVOISIER displayed in perfection afterwards. He examined old books in order to ascertain what was done in times when lighting was a matter both of ordinary and of religious importance. He dwelt on practical questions. Ought candles or oil to be used? What is the best available oil? What is the best material for the wick of a lamp and the best design for the lamp, for the lantern? Ought parabolic or hyperbolic or elliptic reflectors to be used? Ought lanterns to be suspended in the middle of the street or be fastened at the side on the wall? In respect of cost, how does this method, and that, compare with the present method?

LAVOISIER met those questions. In meeting some of them, perhaps, he turned to account a training in optics received from DE LACAILLE. Although neat's foot oil was the best, he decided on the next best, which was olive oil, because it could be obtained in abundance. He remarked that the freezing of an oil could be hindered by dissolving in it a resin, or turpentine, or another oil. He suggested, there being certain disadvantages in the use of oil, that it ought to be within the powers of the chemist to find a means of solidifying oils (*op.cit.*, p.77). He considered the different kinds of reflectors. On principle he dismissed the parabolic. Holding that the making of hyperbolic reflectors would be beyond the capacity of artisans he decided to adopt elliptic reflectors. He designed lamp after lamp, and lantern after lantern, so that the shadow which it cast was reduced to a minimum. A contractor was found who would furnish lanterns of LAVOISIER's design and, using them, would undertake the lighting of Paris for twelve years in return for the annual payment of what was the usual expenditure on lighting.

LAVOISIER's Essay, of which the above is not an exhaustive account, has the quality, and the defect, of trying to exhaust the subject. He designed numerous lanterns and had some of them constructed. But what should gain the Prize was the production of a lantern for lighting Paris, and that the best. Moreover he went back, in the Supplement, on some of the conclusions to which he had come in the Essay. His effort, nevertheless, compelled, and compels, admiration and approbation.

The result of the competition was made known at a public meeting of the *Académie des Sciences*, the *rentrée publique de Pâques*, 1766. None of the Essays had solved the problem of lighting Paris. Hence they were divided into two classes: (I) those that treated of practice, pure and simple, and relied on trials that had been made in public; (II) these that treated the subject on the basis of mathematics and physics and exhibited the advantages and disavantages of one method of lighting after another. The Prize was equally divided into *gratifications* for three competitors in the first class; of the competitors in the second class only LAVOISIER was named: he was to receive, as a special award, a gold medal given by the King and his Essay was to be published by the *Académie des Sciences*.

LAVOISIER continued to work on the subject. He revised and extended his Essay and he pursued various questions in optics that arose out of it (*op.cit.*, 1, pp.440-1; 3, p.104). He investigated, for instance, the ratio between the intensity and the cost in different methods of lighting. Both GRIMAUX and BERTHELOT assume that his Report on this investigation was submitted, in competition for the Prize, along with the Essay. I cannot accept their assumption : the Essay and the Report are separate documents that make no reference to one another. It is rather to be assumed that this Report is part of the large amount of work on Lighting that LAVOISIER did subsequent to the competition.

There is a legend, in connection with this investigation, that LAVOISIER, in order to render and keep his eyes sensitive to differences in the intensity of light, stayed in a dark room for six weeks on end. GRIMAUX accepts it as a narrative of fact (*Grimaux*, p.9). BERTHELOT gives it as a legend, introducing it by the words *on raconte que* (*Berthelot*, p.8). It is not supported by anything in LAVOISIER's Report. I can accept it as proof that LAVOISIER was believed to work at a subject without reserve. I can believe that he made exertions over this subject, of the kind that the legend indicates, but not for six weeks on end.

LAVOISIER returned to the subject of Lighting in the year 1781 : he proposed to write a book upon it. The Opera-House in Paris had been destroyed by fire and the question arose how the new Opera-House should be lighted. He proposed to combine lighting and ventilation by placing lamps, fitted with elliptical reflectors, under openings in the roof of the theatre.

Appendix

Lavoisier on Lighting

1. ***Sur les différents moyens qu'on peut employer pour éclairer une grande ville*** (*O.L.*, 3, pp.1-70). ***Supplément au mémoire précédent*** (*op.cit.*, pp.71-7).

Note. This is the Essay, in an improved and extended edition, that was submitted in competition for the Prize. The Report on the Essay made to the *Académie des Sciences* is available (*op.cit.*, p.84.)

2. *Expériences physiques dans lesquelles on a tâché d'établir le rapport de l'intensité de la lumière à la consommation dans les différentes façons d'éclairer* (*op.cit.*, pp.79-83).

Note. The tables, containing LAVOISIER's numerical data, are not printed.

3. *Rapport sur les lanternes de M. Dufournay de Villiers:* by BRISSON and LAVOISIER (*op.cit.*, 4, pp.28-36). *Addition au Rapport précédent* (*op.cit.*, pp.37-9; cf. *op.cit.*, 3, pp.85-90).

4. *Mémoire sur la manière d'éclairer les salles de spectacle* (*M.A.R.S.*, 1781, 409-20; *O.L.*, 3, pp. 91-102).

5. *Rapport sur la lanterne de M. Beaufils:* by DEFOUCHY and LAVOISIER (*op.cit.*, 4, pp.392-4).

(iv) GUETTARD—Mineralogy and Geology

LAVOISIER's early work, as has been said, was influenced or stimulated by GUETTARD, by DÉPARCIEUX and by LEROY. GUETTARD, who was a friend of the LAVOISIER family, exerted an influence with intention and purpose. DÉPARCIEUX's stimulus, and LEROY's, as will appear later, came as a matter of chance.

GUETTARD (6) was curator of the natural history cabinet that belonged to the DUKE OF ORLEANS. He had a wide knowledge of natural history. He did some work in botany and zoology, much more in mineralogy and geology. At the *Académie des Sciences*, of which he was a member, he was classified as a botanist in days when there was no place there for a mineralogist or a geologist as such. He ranks, in the judgment of GEIKIE, " among the few great founders of modern geology " (*The Founders of Geology*, 1897, p. 15) (7). He advocated doctrines, now accepted as a matter of course, that were strange then even if they were not novel: that certain mountains are extinct volcanoes: that water is an agent that shapes the face of the world by causing disintegration and by forming deposits of rocks and minerals: that fossils, which are derived from plants and animals, belong to geological formations that must needs be followed and studied

(6) JEAN ÉTIENNE GUETTARD (1715-1786).

(7) I venture to draw attention to an appreciation of GUETTARD by a poet: NOYES, *The Torch-Bearers*, vol.2, pp.141-188.

from one country to another. He was the first to construct geological maps : he called them mineralogical maps, the other word not being current then in the modern sense. In the year 1746 he produced a memoir that was accompanied by two maps, one " embracing the whole of Western Europe from the north of Iceland to the Pyrenees and the Mediterranean " (GEIKIE, *op.cit.*, p.21) and the other a map of England and France (*M.A.R.S.*, 1746 (8), 363-302). He prepared a map of Egypt, Palestine and Syria; another of Canada and Louisiana. The production of a mineralogical atlas of France, on a big scale, became his guiding purpose in life.

LAVOISIER, commencing in the year 1763, made numerous studies in mineralogy and field-geology under the guidance of GUETTARD : he estimated the heights of mountains and of strata by the barometric method : he made a study of gypsum and he read two memoirs on that subject at the *Académie des Sciences*, one in 1765 and the other in 1766. His Essay on Lighting came between the first of those memoirs and the second.

LAVOISIER had taken up the study of a local problem. Gypsum exists in large amount, near Paris, at Montmartre : plaster of Paris was made from it there. On the 24th of November, 1764, having observed under the microscope the difference in appearance between gypsum and plaster of Paris, he reflected that the essential difference between these two substances might be caused by water of crystallisation (*O.L.*, 3, p.111, footnote 2).

LAVOISIER, in the first memoir, proved that gypsum is a sulphate of lime and that gypsum and plaster of Paris are convertible into one another by loss and gain of water of crystallization. He gave a measurement of the solubility of gypsum and showed that the solution has a greater density than water.

The second memoir on gypsum is mineralogical and geological in tendency. It is based on ROUELLE's doctrine concerning acid salts and on GUETTARD's doctrine regarding water as an agent in nature. LAVOISIER had made numerous determinations of the solubility of gypsum in water. He concluded that there were three varieties of gypsum differing in composition and solubility : one, the most soluble, containing excess of acid;

(8) This volume appeared in the year 1751; the maps are dated 1746.

another, less soluble, containing acid and lime in the right proportion (*celle dont l'acide et la base sont dans une juste proportion, op.cit.*, p.129); and yet another, the least soluble, containing excess of base. He proceeded to discuss the deposits of gypsum that are found in nature. His supposition was that water would dissolve the most soluble form of gypsum and that the solution would deposit the less soluble forms. He intended to produce studies on similar lines of other minerals (*op.cit.*, p.144).

DUHAMEL and DE JUSSIEU, to whom these memoirs were referred by the *Académie des Sciences*, recommended them for publication. They remarked that LAVOISIER had been anticipated by MARGGRAF in respect of his findings that gypsum is soluble in water and that it is a sulphate of lime. LAVOISIER ought to have known of MARGGRAF's work. But it is not uncommon for a young man to be told that what he thought to be new had been already discovered. LAVOISIER, who read POTT's *Lithéognosie*, relied upon it (*O.L.*, 3, p.106, 112, 121, 124-5) and possibly had not acquired the habit of reading original memoirs at the age of 22. But he gave a proof of the chemical nature of gypsum which is more complete, I think, than MARGGRAF's; he gave data for the solubility of gypsum which no one had done before. The results in the first memoir, obviously, are sounder than those in the second. The first was published by LAVOISIER and the second was not. This is remarkable because the second reveals his enthusiasm for the ideas that are advanced in it. Either he was warned by instinct not to publish it or he decided, in cold blood, that his facts were not sufficient as a basis for his conclusions.

The solubility of gypsum in water was first determined accurately at the beginning of the present century by HULETT (*Zeitschrift für physikalische Chemie*, 1901, 37, 385-406). Thus the problem that LAVOISIER undertook was more difficult than he could know and was not solved during the nineteenth century. His data, which are the first on record, are far from being accurate : he did not obtain saturated solutions. The further explanation of his results is that he worked with gypsum in threads (*en filets soyeux*) and in grains : of course the threads dissolved more readily than the grains and seemed to be more soluble (*O.L.*, 3, pp.132-4).

No one can doubt that GUETTARD had the good of the Mineralogical Atlas in view when he took up LAVOISIER and trained him in the field. His methods were being criticised by a "group of young naturalists" (*Encyclopédie méthodique, Géographie Physique*, an 3 de la République, 1, p. 151) so that he was in need of an ally. He was justified in his choice. The pupil soon became a colleague. LAVOISIER was eager and resolute. Beginning in the year 1763 he accumulated field-notes that now occupy many pages in the *Œuvres*. In the year 1767 he accompanied GUETTARD on a tour, in the east of France, of which I shall give an account later. He continued to make field-notes, after he became an official of the *fermes*, in the districts of France that he visited in the course of his duty. When his standing in science was well established, and also his standing as an official, he exerted himself for the benefit of the Mineralogical Atlas as an organiser : he issued a circular and a questionnaire on rocks and mineral deposits : also he approached Bertin, a minister of state, requesting that funds should be assigned by the government for completing and publishing the Atlas.

The support of the government having been gained, sixteen sections of the Atlas were sent to the engraver in the year 1775. GUETTARD, when he had the pleasure of announcing this result at the *Académie des Sciences*, spoke of LAVOISIER's cooperation in cordial terms :

"I was accompanied in my tours by Mr. LAVOISIER, now of this Academy His love of science, and particularly of mineralogy, made him willing to partake with me the troubles and fatigue of that kind of travelling, and I must needs say that he avoided none of them and that the mineralogical atlas owes to him a degree of perfection that it would not otherwise have had and if I had not been seconded by someone as devoted as he to undertake anything. The observations on certain cantons are even solely due to Mr. LAVOISIER" etc. (*O.P.*, 1775, 5, 359).

That instalment of the Atlas, produced by GUETTARD, and the next, which was produced by MONNET, showed the heights of geological strata, a feature that was due to LAVOISIER's initiative and exertions (9). MONNET used his data of that kind, and

(9) All the work that LAVOISIER did in this direction, by the barometric method and by the geodetic method also, escaped the attention of CAJORI (*History of determinations of the heights of mountains, Isis*, 1929, 12, 499-512).

other contributions, without saying a word as to where they came from (*O.L.*, 5, p.221).

Attention must now revert to an exceptional effort that was made for the Atlas. GUETTARD and LAVOISIER went on tour in the east of France—the Vosges, Alsace, Lorraine—and in parts of Switzerland in the year 1767. They were absent from Paris for more than four months : they left on the 24th June and were back on the 19th October. In this work for the Atlas they had the support of the State : they were officials, sent on a scientific mission. LAVOISIER's father, in order to secure attention in the post for his letters to his son, wanted to put as the address : *A M. Lavoisier, envoyé par le Roi dans les Vosges* (*Grimaux*, p.15).

This was a great and a happy experience for LAVOISIER. He was exhilarated by being in the open air day after day, by frequent changes of scene, by enduring, now and again, what was hardship in comparison with his life at home and by doing work in fulfilment of a purpose. As assistant to GUETTARD he made mineralogical and geological observations, he ascertained the heights of strata by the barometric method and he collected specimens of rocks and minerals for BERTIN, for GUETTARD and for himself. On his own part he made meteorological observations and he examined natural waters by a method that he himself had devised. Later I must say more of this method.

Appendix

Lavoisier on mineralogical and geological subjects

1. Field-notes, of geological interest mainly, are given *O.L.*, 5, pp. 1-173.

2. (i) *Analyse du Gypse* (*Mémoires... par divers Savants...*, 1769, 5, 341-57; *O.L.*, 3, pp.111-27). (ii) *Sur le Gypse* (*op.cit.*, pp.128-44).

Note. For LAVOISIER's abstract of these two memoirs see *op.cit.*, pp.106-10.

3. *Pièces relatives a l'Atlas minéralogique de la France* (*op.cit.*, 5, pp.214-38).

4. *Expériences sur une espèce de stéatite blanche qui se convertit*

seule au feu en un beau biscuit de porcelaine, by GUETTARD and LAVOISIER (*M.A.R.S.*, 1778, 433-4; *O.L.*, 2, pp.238-40).

5. *Description de deux mines de charbon de terre*, by GUETTARD and LAVOISIER (*M.A.R.S.*, 1778, 435-41; *O.L.*, 2, pp.241-8).

Note. This memoir is based on observations made by GUETTARD and LAVOISIER during their tour in the year 1767.

6. *Projet d'une carte minéralogique de la généralité d'Orléans* (*Procès-verbal de l'Assemblée provinciale de l'Orléanais*, p.284; *O.L.*, 6, pp.252-5).

7. *Observations générales sur les couches modernes qui ont été déposées par la mer et sur les conséquences qu'on peut tirer de leurs dispositions relativement à l'ancienneté du globe terrestre* (*M.A.R.S.*, 1789, 351-71; *O.L.*, 5, pp.186-204).

8. *Sur la hauteur des montagnes des environs de Paris* (*op.cit.*, pp.205-13).

Note. LAVOISIER obtained the data on which this memoir is based in the year 1771.

9. Various Notes and Reports: *op.cit.*, 4, pp.51-2; 92-4; 112-24; 153-4; 176-8; 179-82; 232-5; 269-71; 316; 365-7; 399-401; 431-3; 434-8; 439-42; 501-2; 5, 174-5; 176-8; 179-85; 282-41.

PART II

(i) The water-supply of Paris

Much of LAVOISIER's early work can be traced, in respect of origin, to a civic need, namely, a water-supply. The inhabitants of Paris had been suffering from shortage of water for many years. DÉPARCIEUX (10), who was skilled in applied mathematics and in mechanics, proposed to meet this need by bringing a supply from the river Yvette. He raised the subject at the *Académie des Sciences*, first in the year 1762, by a memoir in which he stated his proposal and outlined a scheme for carrying it out (*M.A.R.S.*, 1762, 337-401). When his proposal had gained sufficient attention and approval in Paris he supported and developed it at the *Académie des Sciences* again and yet again (*loc. cit.*, 1766, 149-182; 1767, 1-42).

(10) ANTOINE DÉPARCIEUX (1703-1768).

The *Académie des Sciences* did not confine its attention to what are called academic matters. It was consulted by the Government on questions that involved science in relation to the state. It was concerned for the good of France and had the interests of Paris at heart. DÉPARCIEUX's second memoir (1766), like his first, was read at one of the *rentrées publiques* of the *Académie des Sciences*, that is, open meetings that were held twice a year, at Easter and St. Martinmas. The aim was to bring up at these meetings matters that would appeal, by their general interest and importance, to an educated public. Paris knew and would say, when DÉPARCIEUX read his second memoir, like his first, at a *rentrée publique*, that his scheme had the support of the *Académie des Sciences*. He read it again, by instalments, at three ordinary meetings. Obviously, the academicians wanted to have the opportunity of discussing it in detail. What became of the discussion will appear later.

LAVOISIER was concerned afterwards with DÉPARCIEUX's scheme and also with problems that arose out of his memoir. One might suppose that he was present at that *rentrée publique* and that he listened intently to DÉPARCIEUX. But he was not there : he was away in the direction of Crécy-en-Brie, making field-notes (*O.L.*, 5, p.14).

I must observe, in order to account for LAVOISIER's connection with DÉPARCIEUX's scheme, that his capacity for affairs was displayed as soon as he was admitted to the *Académie des Sciences*. As THORPE remarked, his

> " extraordinary powers of work, his intellectual keenness and range of knowledge, were quickly recognised and in spite of his youth he was charged with the preparation of numerous Reports " (THORPE, *Essays in Historical Chemistry*, 1902, p.180).

Often, a subject was put in his sole charge. A Committee, of which he was a member, usually left the writing of its Report to him. In addition to the qualities noted by THORPE he had the gift of language, the power of making a clear, impressive statement : he could write these Reports to perfection.

The water-supply of Paris, after the death of DÉPARCIEUX, was regarded as LAVOISIER's subject. Twice DÉPARCIEUX's scheme was publicly attacked and, each time, the *Académie des Sciences* entrusted the defence of it to him. Again, an alternative

project was advanced for setting up a pump, worked by a steam-engine, which was to be used in the supply of water to Paris : that was made over to him for examination. The long Report on that project, which he prepared, should be of interest to mechanical engineers because it is replete with data : it gives, for instance, the " performance " of certain steam-engines that were being used in France.

Appendix

Lavoisier on the water-supply of Paris

1. *Réponse à un mémoire intitulé : Réflexions sur le projet de M. de Parcieux, de faire venir à Paris la rivière d'Yvette, par le père Félicien, de Saint-Norbert, carme déchaussé* (*Mercure de France*, October, 1769; *O.L.*, 3, pp.208-20).
2. *Rapport sur la brochure de M. d'Auxiron, relative aux moyens de donner de l'eau à la ville de Paris* (*op. cit.*, pp. 221-6).
3. *Lettre sur les moyens d'amener l'eau à Paris, et sur l'atlas minéralogique de la France* (*op.cit.*, pp.255-60).
4. *Calculs et observations sur le projet d'établissement d'une pompe à feu pour fournir de l'eau à la ville de Paris* (*M.A.R.S.*, 1771, 17-44; *O.L.*, 3, pp.227-54).
5. *Rapport sur un nouveau moyen de procurer de l'eau à la ville de Paris*, by DEMONTIGNY, VAUCANSON, PERRONET and LAVOISIER (*op. cit.*, 4, pp. 68-70).

(ii) DÉPARCIEUX—effects of his second memoir

DÉPARCIEUX was quiet, sincere and able. VOLTAIRE, who knew his worth, called him the " citizen-philosopher." His scheme for the supply of water to Paris was an effort for the public welfare which he thought out, thought through and ensued earnestly. It was strongly supported in Paris. VOLTAIRE, hearing of it at Ferney, wrote twice to its author in terms of admiration for it and of apprehension that it would not be proceeded with.

" Si ma vieillesse et mes maladies m'ont fait renoncer à Paris, mon cœur est toujours votre citoyen. Je ne boirai plus des eaux de la Seine, ni d'Arceuil, ni

de l'Yvette, ni même de l'Hippocrène, mais je m'intéresserai toujours au grand monument que vous voulez élever. Il est digne des anciens Romains, et malheureusement nous ne sommes pas Romains... On ne plaint point son argent pour avoir un opéra-comique, et on le plaindra pour avoir des aqueducs dignes d'Auguste. Je désire passionnément de me tromper. Je voudrais voir la fontaine d'Yvette former un large bassin autour de la statue de Louis XV; je voudrais que toutes les maisons de Paris eussent de l'eau, comme celles de Londres" (le 17 juillet 1767). "Cette entreprise serait digne du gouvernement;... les filles de l'Opéra l'emportent sur les naïades de l'Yvette" (le 17 juin 1768).

What VOLTAIRE foreboded came to pass. The government encouraged operatic music and neglected water-supply. The Opera-House in Paris was destroyed by fire in the year 1781. Another Opera-House must be produced : it was opened within five months (10a). Paris must wait, for an adequate water-supply, till after the Revolution.

DÉPARCIEUX, although his scheme came to nothing, gave a stimulus to experiment and to thought in unexpected ways. In his second memoir (1766) he took into consideration the quality of the water from the Yvette. On his suggestion a Committee, consisting partly of chemists and partly of medical men, had been appointed for the purpose of examining and comparing different waters. The Committee prepared a Report, that DÉPARCIEUX quoted, in which were presented data that showed for each water (1) the specific gravity and (2) the amount of the residue that was obtained on evaporation to dryness. Hence arose further work on means for ascertaining specific gravity and, also, speculation upon the nature of water. Finally, these two kinds of activity were brought together : LAVOISIER, in studying the nature of water, made use of specific gravity determinations.

(iii) Hydrometry

DÉPARCIEUX had devised a hydrometer for working with liquids that differ slightly in specific gravity : he meant it to be used for comparing various waters and the Committee used it for that purpose. Following on this a great interest was taken in

(10a) The date of the burning was the 8th June : of the opening, the 31st October. For these dates I am indebted to Dr. PAUL DORVEAUX.

Hydrometry. At the *Académie des Sciences*, in succession, LAVOISIER, DEMONTIGNY (*M.A.R.S.*, 1768, 435-459), BRISSON (*op.cit.*, 1769, 438-452) and LEROY (*op.cit.*, 1770, 526-39) discussed Hydrometry and described hydrometers. Others, outside the *Académie des Sciences*, were at work on the same subject, for instance BAUMÉ (*Encyclopédie méthodique, Chimie*, 1792, 2, pp.359-60) and CARTIER (*O.L.*, 4, pp.17-20).

This activity is partly accounted for by the stimulus that DÉPARCIEUX gave and partly by the needs of the *fermes*. The dues on alcoholic liquids were increased towards the end of the year 1767. Consequently certain officials of the *fermes* held meetings, early in the year 1768, with a view to arriving at a hydrometer that could be used in testing alcoholic liquids throughout France (LEROY, *loc.cit.*, 526).

LAVOISIER had previously touched upon the subject, in his first memoir on gypsum, by using HOMBERG's hydrometer to show that a solution of gypsum is denser than water. He was the first to follow DÉPARCIEUX. He presented two memoirs on the subject of Hydrometry to the *Académie des Sciences* early in the year 1768. The first of these includes an account of a hydrometer and the second an account of what he had done with it during the tour with GUETTARD. Thus he had a hydrometer, made to his own specification, and a plan for using it ready in June, 1767.

It is necessary to remark that these two memoirs were published, not by LAVOISIER, but by DUMAS and that, as printed, they are not identical with what was presented to the *Académie des Sciences*. Both memoirs are known to have been altered, the first much more than the second.

The title of the first memoir is as follows : ***Recherches sur les moyens les plus sûrs, les plus exacts et les plus commodes de déterminer la pesanteur spécifique des fluides soit pour la physique soit pour le commerce*** (*O.L.*, 3, pp.427-50).

This memoir describes hydrometers of constant and of variable immersion.

DÉPARCIEUX's hydrometer was of the variable-immersion type. LAVOISIER, on considering it, observed that it was sensitive and that it was limited in range : it was sensitive because it was limited. It could show the difference between one natural water

and another because the body was large and the stem slender. But the instrument intended for water could not be used also for alcohol : to use it for alcohol would require prolongation of the stem to an impossible extent.

LAVOISIER devised hydrometers that were based on FAHRENHEIT's hydrometer, that is, they were of the constant-immersion type. Because of that and because the body was large and the stem slender, they admitted of unusually accurate work. The body was a hollow cylinder closed at each end. It was loaded below with tin. Above, it carried a slender upright, the stem, on the top of which was a pan. When the hydrometer was placed in a liquid weights were put in the pan until the hydrometer sank to a mark on the stem.

LAVOISIER had this hydrometer constructed in three sizes : (1) the body made of copper : weight about 10 *livres :* he estimated that it was accurate to 1 part in 184,320; (2) the body made of copper : weight about 4 1/2 *livres :* estimated accuracy, 1 part in 164,896; (3) the body made of silver : weight about 9 *onces :* estimated accuracy, 1 part in 21,086 (*op.cit.*, pp.433, 155). It is known that he had copies made of the 2nd instrument and of the 3rd.

LAVOISIER's purpose was to make Hydrometry accurate. He began without regard to convenience and had to learn from experience. The instrument, weighing 10 *livres*, he never used. That, weighing 4 1/2 *livres*, he used in important work, including that on the Nature of Water (11). Moreover, a copy of it was given to CHAPPE and another, reduced in size, to BORDA in order to be used for observing the specific gravity of sea-water (*Expériences sur la pesanteur de différentes eaux, et principalement de celle de mer depuis Cadix jusqu'aux côtes de Californie*, *op.cit.*, pp.456-60). The silver hydrometer, weighing 9 *onces*, he put to extensive use.

LAVOISIER went on sacrificing accuracy to convenience by working on a still smaller scale. Then he found that an instrument,

(11) LAVOISIER's constant-immersion hydrometer was used in his work on the Nature of Water and was described in his *Traité élémentaire de Chimie* (*O.L.*, 1, pp.254-6). His description was repeated in the *Encyclopédie méthodique, Chimie* (1792, 2, p.358). All this was ignored by BIOT when he ascribed to CHARLES the design and use of an accurate hydrometer which is LAVOISIER's in its main features (BIOT, *Traité de Physique*, 1816, 1, p. 414).

quite small in size and similar in shape, would upset when it was used in water. He therefore gave the body a shape which, roughly, was that of a sphere or of an inverted cone, and loaded the instrument below. It was made of metal for work with alcohol —he had one that weighed 4 *onces*—and of glass for work with acids (*op. cit.*, pp. 434-8). He used the latter frequently in obtaining acid of fixed strength. Thus, for the work that he described in the *Opuscules physiques et chimiques*, he prepared and used nitric acid, again and again, that had the specific gravity 1.29895 (*op.cit.*, 1, pp.560, 562, 565, 575, 577, 583, 593, 595). In two investigations into the nature of acids, one made in the year 1776 (*op.cit.*, 2, p.131) and one in the following year (*op. cit.*, p.252) he used nitric acid of specific gravity 1.31607.

LAVOISIER possibly devised his hydrometer of variable immersion when and because the needs of the *fermes* were being spoken of freely. He had it made in a set of two instruments, one for alcohol and one for heavier liquids. It was the kind of instrument, made of glass and loaded with mercury, that is used in laboratories now, in sets of three or four, for finding the specific gravity, say of mineral acids, rapidly and approximately.

The scale of this hydrometer was numbered so that the specific gravity could be read on it and was numbered decimally. These things, strange as it may seem, were innovations. The prevailing tendency was to put conventional numbers on the scale. The *Encyclopédie méthodique*, so late as the year 1816, reported different scales, one of them showing 0 for alcohol and 34 for water, and nine showing a high number for alcohol and a low number for water (80 and 0, 36 and 11, 40 and 10, 33 and 0.5, 130 and 0, etc.) (*Encyclopédie méthodique*, *Physique*, 1816, 2, p.72). LAVOISIER had to defend a scale in which the numbers were low on the upper part and high on the lower :

> " Certainly it is not without a struggle that I have departed from the usual practice. I know that the slightest innovations are startling at first : that in itself, I do not doubt, will hinder this scale from being taken up at once in commerce. I believed, however, that this difficulty ought not to stop me. It seemed to me entirely contrary to principle to make the number on the scale increase when the weight became less " (*op. cit.*, 3, pp.447-8).

LAVOISIER also drew attention to the tables of specific gravity that the physicists had drawn up :

" When one sees in Mr. MUSSCHENBROECK's table, for instance, 806 against spirit of wine, the meaning is that the weight of this liquid is to that of water as 806 to 1000... The hydrometer that I describe speaks exactly the same language " (*op.cit.*, p.448).

LAVOISIER followed the decimal system on the scale of this hydrometer and also in dividing the livre (*op. cit.*, 1, pp. 249-51). The use of the decimal system had been proposed by SIMON STEVIN in the year 1585 and was urged in the *Encyclopédie* :

" It is greatly to be wished that all divisions, for instance, of the *livre*, the *sou*, the *toise*, the day, the hour, etc., should be made in tenths; this mode of division would render calculation very much easier and more convenient..." (*Encyclopédie*, 1754, 4, pp.669-70).

I cannot doubt that LAVOISIER used the *Encyclopédie* and was influenced by it. But he cited it in only one of his published memoirs (*O.L.*, 3, pp.228, 229, 231, 237). It was under an official ban, a sort of a ban, and the presumption was that nobody had a copy. Yet " everybody " had a copy : according to an amusing story of VOLTAIRE's, the King of France had one. Hence it was possibly understood perfectly, when LAVOISIER used the decimal system, that he was carrying out the recommendation of the *Encyclopédie*.

LAVOISIER described this hydrometer at the *Académie des Sciences*. It then appeared that, in error, he had made the divisions on the scale equal to one another. BRISSON remarked on the error and pointed out the principle on which the scale ought to be divided. LAVOISIER accepted correction (*Lavoisier MSS.*, no.1405, (i) p.29, (ii) p.45) whilst BRISSON made the hydrometer his own, that LAVOISIER had blundered over, by reading a memoir upon it at the *Académie des Sciences* (*M.A.R.S.*, 1769, 433-52).

(iv) Hydrometry as a method in water-analysis

The title of LAVOISIER's second memoir on Hydrometry is as follows : *De la nature des eaux, d'une partie de Franche Comté, de l'Alsace, de la Lorraine, de la Champagne, de la Brie, et du Valois* (*O.L.*, 3, pp.145-205).

This memoir, as a treatise on Hydrometry, has much in common

with the first memoir. Beyond that, it explains the use to which LAVOISIER proposed to put the hydrometer in the examination of natural waters and the use that he did make of it during the tour with GUETTARD.

LAVOISIER mentioned this tour afterwards, again and again, and always in a tone of satisfaction. He was eloquent about it in the memoir :

" Nothing that could contribute to the well-being of society or the advancement of knowledge was ignored on this expedition : we were convinced that men of science could not impose on themselves too severe a task, that they could not embrace too wide a field, that their investigations should extend, within the limits of possibility, to all parts of the sciences, the arts and natural history " (*op.cit.*, p.145).

The spirit of the age comes out in this eloquence : the welfare of society was a current phrase. But the life of LAVOISIER affords proof in abundance that the concern which he expressed for the well-being of society was sincere (12). He worked, during this tour, for the public good by making a contribution to the knowledge of potable waters : about them, he observed, much less was known than about mineral waters :

" If it is interesting for society to know the nature of those medicinal waters, the surprising effects of which have been so often celebrated in the annals of medicine, it is not less interesting to know about these that are used every day for the needs of life. It is on these, indeed, that the health and strength of the citizens depend, and if the first have sometimes been the means of restoring some lives valuable to the State, the last, by maintaining continually order and equilibrium in the animal economy, preserve every day a much larger number of lives. Thus the examination of waters, that are mineral, concerns only a small and languishing part of society. That of ordinary waters concerns society as a whole and, above all, that active part which forms, at once, the strength and wealth of the State " *(ibid.)*.

LAVOISIER, moreover, whilst he was studying natural waters, expected to learn from them something about the geological strata whence they came. Does the examination of waters, he asked, not afford

" another means of divining nature; whilst she works in secret and hides herself carefully from our eyes, do not the waters that flow without ceasing from her laboratory sometimes betray her and disclose her secrets ? " (*op.cit.*, p.146).

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(12) See *Smith College Monographs*, no. 1, 1926, *Life of Lavoisier*, by Dr. MARY LOUISE FOSTER.

LAVOISIER was dissatisfied with the methods of chemical analysis that were then in vogue. He knew that one analyst and another were capable of making very different reports upon the same water. The examination of a water by the process of evaporating it to dryness was unreliable, he held, because that process, he thought, caused loss of the salts that were present in the water.

LAVOISIER proposed to make use of the hydrometer in ascertaining how much of a salt was present in a water. The most common salts in natural waters were Glauber's salt, sea-salt and selenite. He would limit himself, at first, to waters that contained not more than one of these. He would detect the kind of salt by qualitative analysis. Next he would determine the specific gravity of the water : on reference to a table showing the specific gravity of various solutions of that salt he could tell the amount of it in the water.

All this required that preliminary work should be done in Paris. LAVOISIER prepared solutions, in known strength, of the various reagents that were needed for the qualitative analysis. As regards the three salts that he was concerned with, having prepared solutions of them, at different concentrations, he ascertained the specific gravity of each and embodied the results in tables, one for each salt. The difficulty was that, in the field, he must work at the temperature that a water happened to have. He made arrangements to correct for temperature by ascertaining the specific gravities at a standard temperature—it was 10.25° R.—and by ascertaining the apparent weight of distilled water at various temperatures.

LAVOISIER, during the tour, made an examination of 160 waters by this method. He reported on 126 of these. He divided the reports, under the teaching of GUETTARD, into three groups according to the nature of the rock in the locality : (1) refractory or vitrifiable; (2) sandy; (3) chalky. The information was collected in tables that showed : (i) the place where the sample of water was taken; (ii) the weight of the *pied cube* of that water at 10.25° R.; (iii) the excess in weight over the *pied cube* of distilled water at 10.25° R.; (iv) the kind and the amount of the dissolved salt; (v) the nature of the strata from which the water came.

LAVOISIER expressed satisfaction with his method. He remarked,

after having shown by two examples how to reduce a specific gravity to the standard temperature :

" That is about all the examination comes to of waters that contain only a single salt, which is the most common case in nature. The great chains of mountains that are composed of refractory and vitrifiable material, such as quartz, fusible spar, granite even, schist, contain no others... the waters that irrigate these regions contain only a little Glauber's salt; sometimes even they are absolutely pure, and it is so, chiefly, on the loftiest parts of mountains. The water then seems to differ in no way from what we obtain in our laboratories by distillation " (*op.cit.*, pp.172-3).

LAVOISIER was zealous in this work and was simple-minded in his zeal. He explained that he could not take his large hydrometer, weighing 4 1/2 *livres*, into

" a country of a difficult nature where it is not always possible to travel on horseback. ... the error of observation, in the use of the silver hydrometer, can hardly exceed a quarter of a *grain*, which is only 1/21,096 of the mass. ... This degree of accuracy is enough in the strict sense; however, to persons who should travel in a carriage, I should always advise the use of a larger instrument " (*op.cit.*, p.155).

Again, with respect to the calculation by which the specific gravity observation was reduced to the standard temperature, he remarked :

" This calculation is very simple; it can be made in less than five minutes. One can always have with one, when travelling, the portable tables that are necessary and make the calculation in the field. When hard pressed, one will be content to observe the thermometer reading and the weight of water and make a note of them : afterwards the calculation can be made at leisure " (*op.cit.*, p.172).

LAVOISIER's evident hope that travellers would use his hydrometer was not altogether vain : it was taken up, as I have shown, by CHAPPE and by BORDA.

LAVOISIER proposed to extend his method of analysis to waters that contain more than one salt : he would get additional data by observing the amount of reagent that was needed to precipitate one of the salts. He made a beginning with this proposal during the tour, as the results of his water-analyses show. Also, in a short memoir that he read before the *Académie de Rouen*, after touching on the importance of knowing about potable waters and on the discrepancies of ordinary analysis—entirely in the spirit of the long memoir—he gave data for certain waters at Rouen, showing the specific gravity and the amount of sea-salt and of selenite in each (*op.cit.*, pp.206-7; 711-17).

LAVOISIER turned to another method of analysis in the year

1772 when he contributed a memoir to the *Académie des Sciences* on the analysis of sea-water. In this method, spirit of wine was employed and Hydrometry was ignored. Whilst he never proceeded further with his method, involving Hydrometry, he never abandoned it. He intended to publish his two memoirs on Hydrometry and he returned to them, so DUMAS reported, and made corrections in them again and again (*op.cit.*, p.709).

LAVOISIER returned to the use of the hydrometer in a surprising way, namely, for the examination of beef-tea. The *Société royale de médecine* was consulted, in the year 1789, on the regime that ought to be observed in hospitals. LAVOISIER, who was called into council, made the reflection :

" One cannot help a feeling of surprise, whenever one asks oneself about the most familiar and most trivial things, at seeing how frequently one's ideas are vague and uncertain and, on that account, how important it is to settle them on experiments and upon facts " (*op.cit.*, p.563).

It was found that there was no exact knowledge regarding the beef-tea that was given to the sick inmates of the hospitals. Consequently, LAVOISIER embarked on a series of experiments, in which he prepared beef-tea and determined its specific gravity—using his silver hydrometer—and next evaporated it to dryness and weighed the residue. He drew up two tables of data, one showing the results of making beef-tea with different parts of the same ox and another showing, for beef-tea of about 190 strengths, the specific gravity and the corresponding amount of gelatinous matter (*op. cit.*, pp. 572-51. All this work, it would seem, was done in a month (*op.cit.*, p.564, footnote).

Appendix

Lavoisier on Hydrometry

1. ***Recherches sur les moyens les plus sûrs, les plus exacts et les plus commodes de déterminer la pesanteur spécifique des fluides soit pour la physique soit pour le commerce*** (*O. L.*, 3, pp. 427-450).

2. ***De la nature des eaux d'une partie de la Franche-Comté, de l'Alsace, de la Lorraine, de la Champagne, de la Brie et du Valois*** (*op.cit.*, pp.145-205).

3. (i) *Mémoire sur la nature des eaux de la ville de Rouen* (*op.cit.*, pp.711-7). (ii) *De la nature des eaux de la ville de Rouen* (*op.cit.*, pp.206-7).

Note, No. ii was printed by the *Académie de Rouen:* it is an abstract of no. 1.

4. *Expériences sur la pesanteur de différentes eaux et principalement de celle de mer depuis Cadix jusqu'aux côtes de Californie* (*op.cit.*, pp.456-60).

5. *Mémoire sur le degré de force que doit avoir le bouillon, sur sa pesanteur spécifique et sur la quantité de matière gélatineuse solide qu'il contient* (*op.cit.*, pp.563-75).

6. Minor Papers : *op.cit.*, 4, pp.12-4; 17-20.

(See, for water-analysis that does not turn upon Hydrometry, *op.cit.*, 2, pp.29-37; 153-8; 234-7.)

(v) The apparent weight of water : the density of water

LAVOISIER, for the purposes of his work upon Hydrometry, needed to know the apparent weight of water at different temperatures. Further, he proposed to study density : he wanted to know the density of water at a standard temperature; with that as a basis he could find the volume of a hydrometer and, next, the density of any liquid (*O.L.*, 3, p.438-9; 156-7).

Data are to be found in a collection that is entitled—*Pesanteur absolue de l'eau distillée, poids du pied cube de l'eau et contenance de la pinte de Paris* (*op.cit.*, pp.451-5). This is a collection of notes—experimental data, calculations and statements—that were brought together and published by DUMAS—not by LAVOISIER. There is no reason to think that LAVOISIER intended to publish any of it as it stands.

These notes are open to scrutiny and criticism as accounts of unfinished work and not in any other sense. They give the results of tentative and even crude efforts : they indicate the state of physics at the time. LAPLACE and LAVOISIER, by their work on heat that commenced about the year 1780, opened a new era in physics. Subsequently, LAVOISIER gave mature consideration to the problem of ascertaining the density of water and of ascertaining the expansion of water on rise of temperature :

he enumerated the difficulties in the work and the corrections that the observations demand (*Mémoires de Chimie*, 1805, 1, pp.297-301; *O.L.*, 2, pp.774-8). He was thus tacitly criticising the early work in which he had paid little heed to these things.

I. The apparent weight of water at various temperatures

LAVOISIER drew up a set of data which is headed—*Table de la pesanteur apparente de l'eau distillée suivant les différents degrés du thermomètre faite par expériences ultérieures, avec un nouveau pèse-liqueur en cuivre.* This table has three columns showing: (1) the temperature in degrees Réaumur, (2) the weight of water displaced by a certain hydrometer and (3) the corresponding weight of the *pied cube*. The data in the 2nd column were converted into those in the 3rd on multiplying by a factor which is the ratio between the *pied cube* and the volume of the hydrometer. In the 2nd part of the table—it is divided into two parts, as will presently be shown—the factor is 15.6169. In order to obtain that factor LAVOISIER must have found the volume of the hydrometer by adopting a certain value for the density of water.

LAVOISIER needed that table of data for his method of water-analysis in which Hydrometry was employed. Having observed the weight of a water displaced by a hydrometer he referred that weight to the *pied cube*. The difference in weight between the *pied cube* of that water and of distilled water he used in estimating the amount of salt dissolved in the water.

This procedure is open to two comments. The first comment is that LAVOISIER might have treated the data, in the usual way, by dividing the weight of the liquid displaced by the weight of the same volume of distilled water. That would have served the purpose equally well. Instead, he calculated the weight of the *pied cube* of the water because, I think, his mind was set on the determination of density.

The second comment depends on the fact that the data in columns 2 and 3 of the table were obtained by the use of a certain hydrometer, constructed partly of copper and partly of tin. These data were valid only in observations that were obtained by the use of the same hydrometer. No other hydrometer ought

to be assumed to have the same expansion on rise of temperature.

The table consists of series of data over the range (i) 0.53° R. to 11.3° R. and (ii) 7.5° R. to 23.15° R. That is shown in the MS. by a line, omitted in the printed copy, that is drawn between the end of the first series and the beginning of the second (*Lavoisier MSS.*, no.1407). The explanation is that LAVOISIER, having obtained the first series next altered the hydrometer by lightening it and proceeded to obtain the second series. The first series was obtained and the hydrometer was lightened by the 24th January, 1768 (*Lavoisier MSS.*, no.1405, (i) p.18; (ii) p.26).

The following statement gives data for the hydrometer, as used in water at 10.25° R., before and after the lightening:

	Before lightening				After lightening			
Weight	livres	onces	gros	grains	livres	onces	gros	grains
hydrometer	4	7	5	41	4	7	3	56.50
in pan				18.67			1	53.10
water displaced	4	7	5	59.67	4	7	5	37.60

(See *O.L.*, 3, p.454.)

One can see why the hydrometer had to be lightened. When placed in water at 10.25° R. it was brought to the mark by a load of about 19 *grains* in the pan. Hence, in water at 17° or 18°, it must have sunk below the mark of its own weight. LAVOISIER lightened it by removing tin and, the margin being then about 1.75 *gros*, could use it up to 23° (13).

LAVOISIER, in connection with this subject, made an observation to the effect that water has a temperature of maximum density. He recorded in the second memoir on Hydrometry that this temperature was 7.25° R. " Water, when it has reached this point, whether it is heated or cooled, increases in volume " (*op. cit.*, p.164). NOLLET and MACQUER, in reporting on that memoir to the *Académie des Sciences*, drew attention to that observation with approval and as being such as to " surprise all physicists." There was no need, they said, for them to say anything more because LAVOISIER had " demonstrated in the presence of the Academy the experiments that establish this important fact " (*R.A.R.S.*, 1768, May 18th, p.101 v).

This goes to support my contention that LAVOISIER could not

(13) DUMAS went astray by concluding that the data in the Table were obtained before the hydrometer was lightened (*op.cit.*, p.454, footnote).

have received a training of high quality in physics : that subject was not then adequately cultivated in France. NOLLET, who was a physicist, ought to have known that the maximum density of water had been observed at the *Accademia del Cimento* in the seventeenth century (*Essayes of natural experiments made in the Academie del Cimento*, etc., *Englished* by RICHARD WALLER, 1684, pp.81-3).

LAVOISIER demonstrated something genuine at the *Académie des Sciences* although that something was not the maximum density of water. The weight of water displaced by the hydrometer must depend upon two things : (1) on the volume of the hydrometer which, as the temperature rose, can be supposed to have increased uniformly; (2) on the density of water which, as the temperature rises, hardly alters in the neighbourhood of 4° C. and further away lessens with acceleration. The expansion of water slightly exceeds that of copper at about 8° C. Hence, just below that temperature, the weight of water displaced by a copper hydrometer has a maximum value. What LAVOISIER observed was that maximum.

II. *The density of water*

LAVOISIER, with a view to finding the density of water, had a hydrometer constructed of regular shape and of certain dimensions. On the basis of work with that hydrometer he found the weight of the *pied cube* of distilled water to be :

	livres	onces	gros	grains	
at 8.5° R.	69	15	3	40.6	(*op.cit.*, p.452).
at 10.25° R.	69	15	4	58.581	(*op.cit.*, p.452, *cf.* p.157).
at 14.4° R.	69	15	1	13	(*op.cit.*, p.457).

There is no reason to suppose that LAVOISIER regarded these data as final even if and when he made use of them. They show water at 8.5° to be less dense than at 10.25° whilst he knew the reverse to hold. The second and third data are stated as bare results. The first was arrived at by a calculation which is given and which proves that the hydrometer, of regular shape, had the dimensions, in *pouces*, not $4\times4\times8$ as LAVOISIER

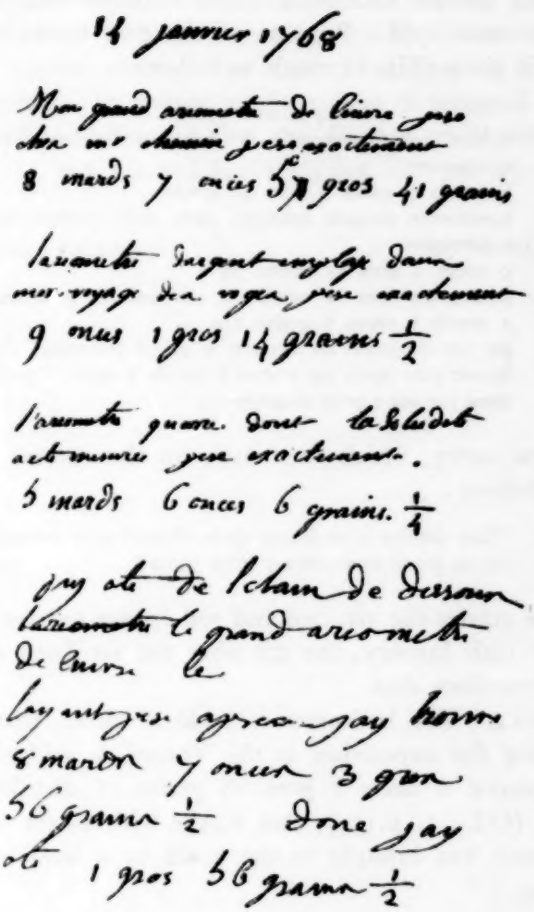

FIG. I
The weights of 3 hydrometers
(LAVOISIER, *Expériences et analyses de diverses eaux* 1768, p.2 r. Archives de l'Académie des Sciences)

said elsewhere (*op.cit.*, p.438), but approximately 3×3×8 (14).

LAVOISIER was engaged in studying the apparent weight of water and the density of water early in the year 1768. That is indicated by his note-book entitled—*Expériences et analyses de diverses eaux* 1768. Page 2r of the note-book, of which a facsimile is given (Fig. I), reads as follows :

" 14 janvier 1768

Entry no.1) " Mon grand areometre de cuivre pese chez mr chemin pese exactement
8 mards 7 onces 5 gros 41 grains

Entry no.2) lareometre dargent employe dans mon voyage des voges pese exactement
9 onces 1 gros 14 grains ½

Entry no.3) lareometre dont la soludite a ete mesuree pese exactement
5 mards 6 onces 6 grains 1/4

Entry no.4) jay ote de letain de dessous le grand areometre de cuivre le layant pese apres jay trouve 8 mards 7 onces 3 gros 56 grains ½ donc jay ote 1 gros 56 grains ½ "

The next entry, which was made on the reverse of page 2, reads as follows :

Entry no.5) "Eau distillee a 10 degres 1/4 le 1er avril 1768 jetois oblige dajouter sur le grand areometre 1 gros 53.10 "

Of these entries the 1st, 2nd and 3rd appear to have been made all on the 14th January, the 5th after the 1st April and the 4th at an intermediate date.

Entry no.2. The hydrometer, made of silver, that LAVOISIER used during the expedition to the Vosges, is said elsewhere to have displaced 9 *onces* 1 *gros* 18 *grains* of distilled water at 10.25° R. (*O.L.*, 3, p.155); that is, the hydrometer when placed in this water was brought to the mark by a load of 3.5 *grains* in the pan.

Entries nos.1, 4, 5. It is to be explained that the *mard* or *marc* was a weight such that 2 *marcs* = 1 *livre*. These three entries refer to one and the same hydrometer, that which LAVOISIER used in observing the apparent weight of water at

(14) The volume of the hydrometer was 213,548,913.3 *points cubes* (*op.cit.*, p.452) or 71 *pouces cubes* 893 *lines cubes* 945.3 *points cubes*. That volume was calculated from exact measurements of the hydrometer with allowance made for the immersed part of the stem. Approximately, the volume was 72 *pouces cubes* and the dimensions were, in *pouces*, 3×3×8.

various temperatures. It was lightened at a date between the 14th January and the 1st April. As shown elsewhere, it was lightened by the 24th January.

Entry no.3. *Soludite* was written in mistake for *solidité*, meaning volume. This entry refers to the hydrometer of regular shape and known volume that LAVOISIER used in finding the density of water. Its weight, as given here, is repeated elsewhere with the trifling difference that the fraction of a *grain* is said to be, not 1/4, but 1/2 and again 3/4 (*op. cit.*, pp. 451-452).

(To be continued)

Morningside, Edinburgh A. N. MELDRUM

Formula

Ueber die Frühgeschichte des Wortes, welches jetzt zu den bekanntesten mathematischen Fachausdrücken gehört, berichtet TROPFKE (1) folgendes : "Bei BOËTIUS (*De institutione arithmetica*, ed. FRIEDLEIN, S. 53, Z. 23; S. 68, Z. 8; S. 71, Z. 17; S. 133, Z. 19) taucht die Deminutivform *formula* auf; er bezeichnet damit (S. 53, Z. 23) die hingeschriebene Einmaleinstabelle oder gewisse daneben vermerkte Zahlenreihen, die er einer Betrachtung unterzieht. Dies Wort erscheint dann im XVI. Jahrhundert wieder in der Bedeutung "Rechenaufstellung, Rechenschema", so bei ORONTIUS FINAEUS (*De geometria practica*, Argentorati 1544, S. 62-98), JOHANNES SCHEYBL (*Compendium arithmeticae artis*, Basileae 1549, Bl. D_1 : *Alia divisionis formula*), CLAVIUS (*Algebra*, Romae 1608, z.B. S. 122, Z. 14, 19). ADRIANUS METIUS benutzt es in seiner *Arithmetica et Geometria* ebenso; die einzelnen Schritte im Entwerfen eines solchen Rechenschemas nennt er *operationes* (*Arithmeticae libri duo et geometriae sex*, Lugduni Batavorum 1626, z.B. S. 17 ff.). Aehnlich verwendet CASPAR SCHOTT (*Cursus mathematicus*, 2. Aufl., Francofurti 1674, S. 584) das Wort *formula*; er rechnet $46\,291\,037^2$ vor; die Schemata der stufenweis ausgeführten Rechnung nennt er *formula prima, secunda...* Im *Lexicon* von G. VITALI (1668) erscheint das Wort noch nicht. Inzwischen hatte es aber in der Descartesschen Schule die Bedeutung "algebraischer Ausdruck" angenommen, so bei DEBEAUNE (1649), HUDDE (1658), DE WITT (1658). Schon LEIBNITZ gebrauchte *formula* ganz in modernem Sinne" usw.

Zu dieser Verfasserreihe bin ich im Stande einen neuen Namen hinzuzufügen, denjenigen von JOHANN VIRDUNG aus Hassfurt in Unterfranken. Ueber das Leben dieses "bei seinen Zeitgenossen wegen seiner astronomischen (und astrologischen) Kenntnisse

(1) J. TROPFKE, *Geschichte der Elementar-Mathematik*, IV, 2te Aufl., Berlin-Leipzig 1923, S. 43.

geschätzten, jetzt aber fast vergessenen Mannes" (2) sind wir noch immer nicht ganz genau unterrichtet (3). Er muss um 1465 geboren sein, bezog die Universität Leipzig im Sommer 1481, begab sich dann nach Krakau, wo er im Winter 1484-5 in das *Album Studiosorum* eingetragen wurde. Er hörte hier die Vorlesungen von ALBERTUS DE BRUDZEWO und wahrscheinlich auch von JOHANNES DE GLOGOVIA MAIORI; im Herbst 1486 wurde er Baccalaureus artium. Im Winter 1487 kehrte er nach Leipzig zurück, wo er am 28 Dezember 1491 das Magisterium erwarb. Auf das nächstfolgende Jahr fällt wohl seine Reise nach Rom und Frankreich (4). Im Herbst 1492 taucht er in Heidelberg auf, wo er sich wieder immatrikulieren lässt, wahrscheinlich in der Absicht Medizin zu studieren. Spätestens im J. 1494 erwarb er sich dortselbst die Stellung des "Mathematicus" (Astrologen) und "Bombardisten" am Hofe des Kurfürsten PHILIPP DES AUFRICHTIGEN von der Pfalz (1476-1508), welche er auch unter dessen Nachfolger LUDWIG V (DEM FRIEDFERTIGEN, 1508-1544) bekleidete. In Heidelberg, wo er an der Universität Mathematik, Astronomie und Medizin vortrug, scheint er den Rest seines Lebens zugebracht zu haben, abgesehen freilich von den "zahlreichen Reisen", welche ihn an andere Fürstenhöfe führten (5).

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(2) G. BAUCH, *Deutsche Scholaren in Krakau in der Zeit der Renaissance* (Sonderabdruck aus dem 78. Jahresbericht der Schles. Gesellschaft für vaterländische Cultur), Breslau 1901, S. 33.

(3) Trotz der Forschungen von G. BAUCH (vgl. Anm. 2), G. HELLMANN (*Beiträge zur Geschichte der Meteorologie*, I, Berlin 1914, S. 14 ff., II, Berlin 1917, S. 219-220) und K. PIEKARSKI (*Drobiazgi bibljograficzne*, I-II, Krakow 1924, S. 5-9, 15-16). Der alte C. C. WUNDT, dessen *Programma memorabilium ordinis philosophici Heidelbergensis partem secundam exhibens*, Heidelbergae 1783, S. 17, von J. F. HAUTZ, *Geschichte der Universität Heidelberg*, I, Mannheim 1862, S. 432, als die Quelle angegeben wird, welche " die näheren Nachweisungen" über VIRDUNG enthalten soll, bietet in Wirklichkeit nichts bemerkenswertes. Der Artikel S. GÜNTHERS in der *Allgemeinen Deutschen Biographie*, XL, Leipzig 1896, S. 9-10, ist auch sehr dürftig.

(4) Ueber seinen Bildungsgang in der Astrologie berichtet VIRDUNG selbst in der Vorrede zu den *Tabulae Resolutae* (ed. 1542 fo. 7 recto) : "Iam putavi... neutiquam praetermittenda etiam esse iuniorum experimenta et quae ipse partim longo prognosticandi usu didici, partim consecutus sum a disciplinae huius cultoribus, in variis meis lustrationibus, potissimum Cracoviae in Sarmatis, Romae et in nobilioribus Galliarum nostraeque Germaniae academiis".

(5) *A.a.O.* fo. 6 verso : "Antea (vor der Reise nach Dänemark), cum ad principes crebris itineribus motoriam, uti dicitur, fabulam agerem, non erat [mihi] unus aliquis liber, qui, quae necessaria sunt ad praedictiones, omnia complecteretur".

So hören wir, dass er sich im J. 1503 nach England, "magicae discendae gratia", begeben habe (6). Seine Reise nach Dänemark und nach anderen nördlichen Ländern (7) muss noch später erfolgt sein, da er sie zusammen mit JACOBUS CURIO gemacht hat (8), welcher erst 1497 geboren sein soll (9) und zum frühesten seit 1502 VIRDUNGS Schüler gewesen ist (10).

Das genaue Todesjahr VIRDUNGS ist uns z.Z. nicht bekannt. Dass er im J. 1526 noch am Leben war, werden wir weiter unten sehen; die Angabe (11) dagegen, er sei erst um 1550 gestorben, beruht zweifellos auf Missverständnissen (12); er überlebte

(6) BAUCH *a.a.O.* S. 34.

(7) In der erwähnten Vorrede, welche an JACOBUS CURIO (s. Anm. 20) gerichtet ist, erzählt VIRDUNG über diese Reise (fo. 6 verso-7 recto): "Parato hoc compendio [astrologiae] minimum sarcinae equis, quibus vehebamur, imposuimus. In comitatu dum esses accito mihi ad Danorum regem ultra Mare Balthicum et ad alios postea Cymbrorum regulos, vidisti non aliis me instructum fuisse libris, quam unico hoc volumine. Unde quoties res postulabat, siderum motus... non tantum supputabam, verum inde etiam rationem petebam exponendarum geneseon" usw. Das letzte Wort bedeutet hier offenbar die Geburt (astrologische Nativität) und nicht das Buch *Genesis*, wie es GÜNTHER (der die Stelle aus WEIDLER kannte) auffasste.— Was für "Cymbrorum reguli" es waren, welche VIRDUNG damals besuchte, ist nicht ganz klar; wohl aber sind damit die norddeutschen Fürsten gemeint. In diesem Zusammenhange weise ich darauf hin, dass in der Tabelle auf fo. 43 verso-44 recto die geographischen Koordinaten folgender Städte (u.a.) enthalten sind: Danzig, Greifswald, Königsberg, Lübeck und Rostock (daneben auch Kopenhagen, Riga, Stockholm und "Nidrosia Nord." d.h. Trondheim).

(8) S. Anm. 7.

(9) Dieses Datum giebt HAUTZ an; vgl. unten Anm. 20.

(10) Die bereits mehrere Male herangezogene Vorrede zu den *Tabulae Resolutae*, welche wahrscheinlich im J. 1526 und spätestens 1530-1532 geschrieben worden sind (vgl. weiter unten), beginnt mit den Worten (ed. 1542 fo. 6 verso): "Meministi, JACOBE CURIO, dum annis abhinc vigintiquatuor et amplius in mea esses disciplina mihique adeo domesticus, quantum operae posuerim primum in demonstrandis caelestium motuum theoriis et ostendendis tabularum usibus, deinde etiam in tradenda praedictionum doctrina". Wenn wir an dem Jahr 1526 als dem Entstehungsdatum der *Tabulae Resolutae* festhalten, sind wir gezwungen anzunehmen, CURIO sei seit 1502 VIRDUNGS Schüler gewesen; dann kann aber das überlieferte Geburtsjahr CURIOS (1497) nicht richtig sein. Auch die Verlegung jenes Entstehungsdatums auf die Jahre 1530-1532 würde uns nur wenig helfen; im Knabenalter von 11 Jahren beginnt man ja kaum das Studium der Astronomie. Vielleicht müssen wir also damit rechnen, dass der Herausgeber die Angabe "(mehr als) 24 Jahre" an das Erscheinungsjahr der *Tabulae* (1542) angepasst haben kann. In diesem Falle wäre CURIO erst um 1518 VIRDUNGS Schüler geworden, als er bereits ein Zwanzigjähriger war.

(11) An welcher noch PIEKARSKI festhält.

(12) Man berücksichtigte nicht den Umstand, dass die *Tabulae Resolutae*

vielmehr nicht das Jahr 1542 (s. unten). Zehn Jahre früher, im Januar oder Februar 1532, verfasste er die *Epistola ad lectorem*, welche sein Werk *Nova medicinae methodus* beschliesst (13). Er muss demnach um 1535, im Alter von etwa 70 Jahren, gestorben sein.

VIRDUNG ist vor allen Dingen ein Astrolog gewesen (14). Nach dem damaligen Brauche veröffentlichte er jedes (oder fast jedes) Jahr ein astrologisches *Judicium* ; eine ganze Reihe derselben ist uns noch erhalten (15) und es würde sich wohl lohnen, sie einmal nach den darin eventuell enthaltenen biographischen Angaben durchzusehen (16). Seine älteste uns bekannte Schrift dieser Art bezieht sich auf das Jahr 1487. Als sich im J. 1514 Papst LEO X an die Universitäten und Gelehrte der ganzen Welt mit dem Wunsche wandte, sie mögen ihre Vorschläge zur Verbesserung des kirchlichen Kalenders vorlegen, verfasste VIRDUNG ein entsprechendes Schreiben im Auftrage der Heidelberger Universität, welche es nach Rom weiterschickte (17);

(publ. 1542) ein posthumes Werk VIRDUNGS sind (s. unten) und dass die 1542-1545 erschienenen Ausgaben der *Grossen Practica* lediglich deutsche Uebersetzungen eines zuerst im J. 1521 gedruckten lateinischen Werkes sind (vgl. HELLMANN, *Beiträge* I, S. 61-62).

(13) *Nova medicinae methodus*... JOANNE HASFURTO VIRDUNGO... autore, Ettelingae 1532, in quarto. Das Kolophon dieser Ausgabe lautet : "Impressum per VALENTINUM KOBIAN anno Natalis millesimo quingentesimo tricesimo secundo, mense Februarii"; die *Epistola ad lectorem* VIRDUNGS (fo. 99 recto-verso) schliesst mit den Worten : "Ex Heidelberberga (!) anno Virginei partus MDXXXII". In dem Texte (Tract. II c. 4, fo. 22 verso) wird ein astrologisches Beispiel aus dem Jahre "1529, die quintodecimo Decembris" angeführt.

(14) Eine astrologische Handschrift aus seinem ehemaligen Besitze befindet sich heutzutage in Rom, cod. Palat. lat. 1369; sie ist ihm von einem gewissen "dominus LEONHARDUS LUYSER in civitate Poppardia" geschenkt worden (FR. SAXL, *Verzeichnis astrologischer und mythologischer illustrierter Handschriften des lateinischen Mittelalters in römischen Bibliotheken*, Heidelberg 1915, S. 16).

(15) Aus der Zeit bis 1500 zählt HELLMANN (*Beiträge* II) 14-15 Stücke auf; 15 weitere Stücke aus den Jahren 1521-1545 hat er schon früher beschrieben (*Beiträge* I, S. 57-62). Vgl. auch E. ZINNER, *Verzeichnis der astronomischen Handschriften des deutschen Kulturgebietes*, München 1925, Nr. 4022 („Joh. Hayssfuer"), 11520, 11521.

(16) Aufgrund der *Practica pro anno 1491 currente* vermochte z.B. PIEKARSKI endgiltig festzustellen, dass VIRDUNG ein Schüler von ALBERTUS DE BRUDZEWO gewesen sei. In der *Nova medicinae methodus* (Tract. IV, fo. 81 verso) erwähnt VIRDUNG einen Bekannten : "dominus CAROLUS DE MONTE FELICI". Wer ist das gewesen?

(17) PAULUS DE MIDDELBURGO, *Secundum Compendium Correctionis Calendarii*, Romae 1516, fo. a_4 verso-b_1 recto.

es scheint bisher nicht wiedergefunden zu sein. Ausser den Prognostiken besitzen wir aber von ihm ein iatromathematisches Werk unter dem Titel *Nova medicinae methodus nunc primum et condita et edita ex mathematica ratione morbos curandi*, Ettelingae 1532 (18), sowie ein astronomisches, welches uns hier ausschliesslich interessiert.

Es führt den Titel *Tabulae Resolutae de supputandis siderum motibus*, Norimbergae 1542 (19), in quarto. Dieses Tafelwerk ist von dem bereits erwähnten Schüler und Freund VIRDUNGS, JACOBUS CURIO (20) aus Hof (deshalb "Hofemianus") (21), zum Druck befördert worden. In der Vorrede des Herausgebers findet sich die folgende Stelle (fo. 5 recto-verso) : "Conferentibus itaque aliis alia, ipse in scholae usum et incrementum extrudo communicoque hunc de siderum intelligendis pariter et supputandis motibus librum, quo me olim exercuit cognatione, officiis et longa familiaritate coniunctissimus mihi IOANNES HASFURDIUS, quem virum nosti (22), quantus in mathematicis tum numeris, tum praedictionibus fuerit, quam et exquisita in his diligentia" (23).

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(18) Vgl. oben Anm. 13. Eine zweite Auflage, mit Verbesserung der zahlreichen Druckfehler der ersten, erschien "Hagenoae per VALENTINUM KOBIAN anno millesimo quingentesimo tricesimo tertio [1533], mense Martio", in quarto. Eine kommentierte Ausgabe, unter Hinzufügung weiterer ähnlicher Werke, veranstaltete J. P. GALLUCIUS SALOENSIS unter dem Titel *De cognoscendis et medendis morbis ex corporum coelestium positione*, Venetiis 1584, in quarto.

(19) Der Versteigerungskatalog der Bibliothek von MICHEL CHASLES (1881) gibt irrtümlich das Datum 1541 an (S. 335 Nr. 3367).

(20) Ueber CURIO (1497?-1572) vgl. HAUTZ *a.a.O.* S. 426-427 und öfters.

(21) Ob er HOFFMANN hiess, wie manche behaupten, scheint mir nicht ganz sicher, wenn auch wahrscheinlich zu sein.

(22) Die Vorrede CURIOS wendet sich an den Erzbischof von Mainz, Kardinal ALBRECHT aus dem Hause Brandenburg. Auf fo. 4 verso wird dessen Bibliothek erwähnt, worin sich auch astronomische Instrumente befanden. Ich finde kein einziges Wort über diese Bibliothek in der Monographie von J. H. HENNES, *Albrecht von Brandenburg*, Mainz 1858.

(23) CURIO fährt weiter folgendermassen fort : "Statueram initio de motibus in numeros resolutis *Tabulas*, quas ex *Alphonsinis* (opinor) REGIOMONTANUS derivavit, proponere scholae. Verum ubi hae nostrae viderentur illis collatae multo esse breviores et habere quiddam de stellarum theoria coniunctum, putavi convenire, ut *Tabellas* huiusmodi usucapione propemodum iam meas excudendo docendoque communes facerem". In der Tat sind die *Tabulae Resolutae* VIRDUNGS viel bündiger als jene, auf welche CURIO in dem ersten Satze anspielt, d.h. die gleichnamigen *Tabulae Resolutae* des XV. Jahrhunderts. CURIO hat jedoch nicht recht, wenn er das letzterwähnte Tafelwerk dem REGIOMONTANUS zuschreibt (worin er übrigens die Ansicht von VIRDUNG selbst wiederholt, vgl.

Und weiter (fo. 5 verso) : " Age igitur eas tibi, non inutili illustratas commentario (24) *Tabulas*, Clementissime Princeps, tanquam proles suo orbatas parente dedico" usw. Aus diesen beiden Stellen muss man folgern, dass VIRDUNG im J. 1542 nicht mehr am Leben war und dass CURIO die Tafeln aus seinem Nachlasse herausgegeben hat. Und zwar bildeten sie ursprünglich den ersten Teil eines grösseren von VIRDUNG verfassten Kompendiums der Astronomie und der Astrologie. Die auf fo. 6 verso-8 recto abgedruckte "Praefatio auctoris ad IACO. CURIONEM" erwähnt nämlich die Tafeln nur beiläufig, beschreibt dagegen recht ausführlich die Entstehungsgeschichte eines Buches, "qui quae necessaria sunt ad praedictiones [astrologicas], omnia complectebatur" (25). VIRDUNG hat dasselbe zum Gebrauch seiner Schüler (unter denen neben CURIO auch ein gewisser APPOLINARIS VERENTINUS genannt wird) verfasst und CURIO diente ihm als Kopist (26). In dieser Gestalt begleitete es die beiden auf ihrer Reise nach Dänemark (27). Es zerfiel in zwei Teile : den astronomischen, in welchem sich der Verfasser auf PTOLEMAEUS, ALPHONSUS und REGIOMONTANUS stützte, und den astrologischen, wo er neben den arabischen und lateinischen "Klassikern" der

fo. 20 recto : "In *Tabulis Resolutis*, quas REGIOMONTANUS, opinor, ex *Alphonsinis* digessit"); dieses ist nämlich in Krakau in der ersten Hälfte des XV. Jahrhunderts entstanden, worüber ich an anderer Stelle ausführlicher handeln werde. Anweisungen zum Gebrauch der Krakauer *Tabulae Resolutae* hat sowohl ALBERTUS DE BRUDZEWO als JOHANN VON GLOGAU verfasst; spätestens seit 1476 gehörten jene Tafeln zu den obligatorischen Vorlesungen an der Jagellonischen Universität und es ist nicht daran zu zweifeln, dass VIRDUNG sie in Krakau kennengelernt hat.

(24) D.h. durch die Erklärung VIRDUNGS selbst. Dieselbe ist sehr ausführlich (fo. 8 recto-44 recto), viel länger als die eigentlichen Tafeln (fo. 44 verso-60 recto), und enthält nicht nur die Anweisung zum Gebrauch der Tafeln, sondern auch eine ziemlich vollständige Darstellung der geozentrischen Planetentheorie (vgl. die in der Anm. 23 angeführten Worte CURIOS). GÜNTHER, welcher das Buch offenbar nicht gesehen hat (was übrigens auch für alle anderen Verfasser der Fall ist, die im XIX-XX. Jahrhundert über VIRDUNG handelten und die ich kenne), hat also ganz und gar unrecht, wenn er schreibt (S. 10) : "Nach dem Urteile von Kennern war das Tafelwerk sehr nützlich, wenn auch hinsichtlich der Begründung etwas zu kurz gehalten". Er hat wahrscheinlich die Worte J. F. WEIDLERS (*Historia astronomiae*, Vitembergae 1741, S. 363) missverstanden : "Perspicuitatem in eo desiderat DECHALES p. 86".

(25) Vgl. oben Anm. 5. An anderen Stellen bezeichnet es VIRDUNG als "collectiones illae nostrae" (fo. 6 verso) und "coacervationes tumultuariae, quae inter docendum magna ex parte sunt natae" (fo. 7 recto).

(26) Vgl. fo. 6 verso : "quod simulatque a te notis scite esset exceptum" usw.

(27) Vgl. oben Anm. 7.

Sterndeuterei auch die "iuniorum experimenta" berücksichtigte(28). Für die Veröffentlichung war jenes Werk, die *Lectiones Astronomicae* (wie es der Verfasser nachträglich betitelte), von vornherein nicht bestimmt (29); auf das Drängen seiner Freunde hin hat sich jedoch VIRDUNG schliesslich dazu bewegen lassen, dasselbe für den Druck vorzubereiten. Da er jedoch sehr beschäftigt und zudem krank war, sandte er das Buch an CURIO mit der Bitte, "ut ipse tu... negotium in te recipias absolvendi perpoliendique, quod ipse inchoavi, lacerumque et imperfectum reliqui" (30).

Aus dieser Inhaltsangabe der *Praefatio* geht klar hervor, dass das Manuskript, welches VIRDUNG (von Heidelberg aus) an CURIO (nach Mainz) gesandt hat, vieles enthielt, was wir in den gedruckten *Tabulae Resolutae* nicht finden. Das nähere darüber erfahren wir aus der folgenden Stelle im ersten Kapitel (fo. 9 verso): "Tractare nunc utriusque, astronomices scilicet et astrologiae, partes aliquot pergam; et cum altera alteram cognitione et dignitate antecedat, incipiam primo hoc libro ostendere viam, qua facili negotio possint studiosi astrorum motus supputare... Transibo deinceps ad ea, quae conducunt praedictionibus; quarum cum multiplex et apprime difficilis sit ratio, novem comprehensa libris a me illa (= astrologia) tradetur". Von diesen neun Büchern findet man nun in dem Druckwerke von 1542 keine Spur; offenbar hat CURIO sich damit begnügt nur das erste Buch der *Lectiones* herauszugeben, die übrigen hat er sich für eine spätere Veröffentlichung vorbehalten (31), die jedoch schliesslich ausgeblieben ist.

Ich habe mich ziemlich lange bei dieser literarischen Frage aufgehalten, einmal deshalb, weil die *Tabulae Resolutae* VIRDUNGS ein ziemlich seltenes Buch geworden sind und (soweit ich weiss) keinem modernen Geschichtschreiber der Astronomie vorgelegen haben, zweitens aber und hauptsächlich deswegen, weil die von VIRDUNG mitgeteilten Nachrichten über die Schicksale seines

(28) Vgl. oben Anm. 4.

(29) Fo. 7 recto: "Numquam animus fuit mihi tamen aedendi (!) in publicum coacervationes tam tumultuarias, quas (quod inter docendum magna ex parte sint natae) *Lectionum Astronomicarum* titulo inscribere nuper libuit".

(30) Fo. 7 verso.

(31) Vgl. die Vorrede CURIOS fo. 5 verso: "quae [astronomia] quantum conducat in vita quantaque complectatur commoda, in aliis HASFURDII libris, invitante occasione, dicam".

Manuskriptes uns vielleicht dazu verhelfen werden, eine chronologische Schwierigkeit zu lösen, welche nicht ohne Bedeutung ist für die Feststellung des Datums, seit welchem sich der Fachausdruck *formula* in der mathematischen Literatur auszubilden begann.

Die erwähnte Schwierigkeit besteht darin, dass man in dem Werke, so wie es gedruckt vorliegt, chronologische Angaben findet, welche im schlechten Einklang damit stehen, was man sonst über das Leben VIRDUNGS weiss. Einerseits weist eine ganze Reihe von denselben darauf hin, dass die Tafeln im J. 1526 entstanden sind. So lesen wir im Kap. XXX (fo. 35 recto): "... (Stella) Polaris... latitudinem habens graduum 66, quaeque anno hoc 1526 recta linea ad 20 gradum Geminorum refertur", und der Fixsternenkatalog führt den Titel (fo. 41 verso--42 recto): "Stellae ad annum 1526 ex ALFONSO verificatae" (vgl. auch fo. 39 verso, 40 verso, 41 verso). Die Rechnungsbeispiele in der Gebrauchsanweisung beziehen sich auf die Jahre 1514 (fo. 26 verso), 1516 (fo. 28 verso), 1524 (fo. 27 verso), vorwiegend aber auf das Jahr 1525 (fo. 17 recto, 18 recto, 21 recto, 22 recto, 25 recto, 25 verso, 29 verso, 32 recto). In den Tafeln kommen als *radices* die Jahre 1508, 1510, 1520 und 1525 vor, und zwar sind dieselben so eingerichtet, dass sich die "ersten Perioden" *(anni collecti)* auf die Jahre 1508-1527 (1528), 1510-1529 (1530), 1520-1529 (1540) erstrecken (32). Aus allem diesen geht klar hervor, dass der Verfasser an seinem Werke im J. 1526 arbeitete. Anderseits aber lesen wir im Kap. X (fo. 17 verso): "Radices mediorum motuum in his nostris *Tabulis* relatae sunt ad meridianum... Edelbergae, ubi PHILIPPO primum, deinde LUDOVICO, clarissimis Germaniae principibus iisdem Imperii Romani electoribus, ad annum tricesimum octavum et amplius servivi". Aus dieser Angabe und dem Jahre 1526 als dem Entstehungsdatum der Tafeln würde es sich ergeben, dass VIRDUNG bereits im J. 1488 in den Diensten des Kurfürsten

(32) Die *anni collecti* 1508, 1528, 1548... kommen in der *Tabula augis Solis* (fo. 51 recto), die *anni collecti* 1510, 1530, 1550... in den Planetentafeln (fo. 44 verso-48 verso), die *anni collecti* 1520, 1540, 1560... in der Präzessionstafel (fo. 60 recto) vor. Die *Radices motus augium et stellarum fixarum* (fo. 58 recto) und die *Radices motus accessus et recessus octavae sphaerae* (fo. 58 verso) sind für jedes einzelne Jahr 1525, 1526, 1527... (bis 1604 bezw. 1607) eigens tabuliert.

PHILIPP gestanden habe; zu jener Zeit aber studierte er noch, wie wir sahen, in Leipzig.

Um den Wiederspruch zu lösen, kann man einen doppelten Weg einschlagen. Entweder geht man von dem Jahre 1526 aus und nimmt die Schlussfolgerung an, dass VIRDUNG tatsächlich im J. 1488 (oder 1487) in den kurpfälzischen Dienst eingetreten sei; wenn wir bedenken, dass er volle fünf Jahre dazu brauchte, um vom Baccalaureus (Herbst 1486) zum Magister (Ende 1491) zu promovieren, dürfen wir mit der Möglichkeit rechnen, er habe dieses Lustrum nicht ganz in (Krakau und) Leipzig zugebracht, sondern sei schon damals für eine kurze Zeit in Heidelberg gewesen. Oder aber nimmt man die feststehende Tatsache zum Ausgangspunkt, VIRDUNG sei im J. 1494, wenn nicht im J. 1492, Hofastrolog des Kurfürsten geworden; addiert man zu diesen Zahlen die erwähnten 38 Jahre, so kommt man auf die Zeit 1530-1532 als den *terminus ad quem* für die Beendigung der *Tabulae Resolutae*. In diesem Falle muss man nur annehmen, dass er zwar die Tafeln selbst im J. 1526 verfasste, an dem Manuskripte aber des ganzen Werkes, welchem er nachträglich den Titel *Lectiones Astronomicae* gegeben, noch weiter arbeitete, und zwar ungefähr bis zum J. 1532.

Auf jeden Fall sehen wir jedoch, dass die *Tabulae Resolutae* VIRDUNGS früher geschrieben und auch früher veröffentlicht worden sind, als die *Geometria Practica* von ORONTIUS FINAEUS (1544), d.h. als das älteste Werk des XVI. Jahrhunderts, in welchem TROPFKE das Wort *formula* = Rechenschema gefunden zu haben angibt. Bei VIRDUNG kommt aber das Wort in dieser Bedeutung öfters vor, wie wir es des näheren weiter unten zeigen werden.

Es gilt jedoch vorerst die Angaben TROPFKES in der Hinsicht nachzuprüfen, ob er berechtigt ist die Geschichte des modernen Fachausdruckes *formula*, *la formule*, *die Formel* an BOËTIUS, FINAEUS und SCHEYBL anzuknüpfen. Zu diesem Zwecke muss man sich vor allen Dingen Klarheit darüber verschaffen, was das Wort in der modernen Mathematik bedeute.

D'ALEMBERT definiert es auf die folgende Weise (33) : "*Formule*

(33) *Encyclopédie méthodique...* par une Société de gens de lettres, de savants et d'artistes. [Abteilung :] *Mathématiques*, par MM. D'ALEMBERT, l'abbé BOSSUT, etc., II, Paris-Liége 1785, S. 97. In dem *Dictionnaire des sciences mathématiques*

(en algèbre) est un résultat général tiré d'un calcul algébrique et renfermant une infinité de cas; en sorte qu'on n'a plus à substituer que des nombres particuliers aux lettres, pour trouver le résultat particulier dans quelque cas proposé que soit. Une *formule* est donc une méthode facile pour opérer" usw. Der letzte Satz ist hier zweifellos am wichtigsten, denn er drückt eine besondere Eigentümlichkeit aus, welche das Wort *Formel* in der mathematischen Terminologie angenommen hat. Die Juristen sprechen z.B. von einer "Eidesformel", d.h. sie setzen *Formel* = "vorgeschriebene oder allgemein gebräuchliche Worte für einen bestimmten (Rechts-)Fall" (34); in der Sprache der Chemiker sind "die Formeln" eine Art von stenographischen Abkürzungen, mit welchen die chemischen Verbindungen gekennzeichnet werden (so ist z.B. der Ausdruck HNO_3 "die chemische Formel" der Salpetersäure). In diesen beiden Wissenschaften hat die *Formel* mit einer "méthode pour opérer" nichts oder fast nichts zu schaffen; die juristische Formel verhält sich zu der mathematischen ungefähr wie das Passivum zu dem Activum, und zugleich wie das Praeteritum zu dem Futurum: dort bedeutet das Wort etwas von vornherein Vorgeschriebenes, hier eine Vorschrift für die Zukunft.

Mit etwas anderen Worten, wie D'ALEMBERT, drückt LAGRANGE eigentlich denselben Grundgedanken aus, wenn er schreibt (35): "L'algèbre plane, pour ainsi dire, également sur l'arithmétique et sur la géometrie; son objet n'est pas de trouver les valeurs mêmes des quantités cherchées, mais le système d'opérations à faire sur les quantités données pour en déduire les valeurs des quantités qu'on cherche, après les conditions du problème. Le tableau de ces opérations représentées par les caractères algébriques, est ce qu'on nomme en algèbre une *formule*". CHARLES DE COMBEROUSSE verbindet die beiden Definitionen in

pures et appliquées von A. S. DE MONTFERRIER (II, Paris 1845, S. 35) findet man eine etwas kürzere Definition, welche jedoch offensichtig auf diejenige von D'ALEMBERT zurückgeht.

(34) Vgl. z.B. P. F. L. HOFFMANN, *Wörterbuch der deutschen Sprache*, 5te Aufl., Leipzig 1905, S. 165. Diese Bedeutung stammt aus dem römischen Rechte her, vgl. PAULY-WISSOWA, *Realenzyklopädie der klassischen Altertumswissenschaft*, VII, Stuttgart 1909, Sp. 2859-2876 (Artikel von WENGER).

(35) *Traité de la résolution des équations numériques de tous les degrés*, 3e éd., Paris 1826, S. XXII.

den folgenden Sätzen (36) : "En algèbre... on obtient une *formule*, c'est-à-dire une expression où les opérations à faire sur les quantités données pour en déduire les quantités inconnues, sont régulièrement indiquées. De sorte que si la même question se présente avec d'autres données spéciales, il suffit de substituer ces nouvelles valeurs particulières aux symboles généraux dans la formule trouvée". Nur scheinbar vollständiger ist das, was wir bei P. LAROUSSE lesen (37) : "Le mot *formule* s'emploie en mathématiques dans plusieurs acceptions. La *formule* de l'inconnue d'un problème est l'expression de cette inconnue au moyen des données ou en fonction des données; elle contient l'indication des opérations qu'il faudrait effectuer sur les données pour en former l'inconnue. On entend encore par *formule* l'expression, en langage algébrique, d'une des lois d'un phénomène... Enfin, on désigne encore sous le nom de *formules* des identités remarquables ou souvent employées; telles sont la *formule du binôme de Newton*, la *formule de Moivre*, etc.". Man sieht leicht ein, dass alle diese Einzelfälle in den Definitionen von D'ALEMBERT und LAGRANGE eigentlich enthalten sind (38).

Auf diese Weise liegen also die Dinge in der modernen Mathematik vor; das Wort *Formel* ist hier untrennbar mit dem Begriffe einer Methode, einer Vorschrift, einer zu befolgenden Regel verbunden, welche dazu dient, um von dem Gegebenen ausgehend das Unbekannte zu berechnen. Als die Vorläufer von D'ALEMBERT und LAGRANGE können demnach nur jene Mathematiker der alten Zeit gelten, bei denen das Wort *formula* mit ebendenselben Begriffen zusammenhängt.

Für BOËTIUS (*Institutio arithmetica*) ist dies sicherlich nicht der Fall. An allen vier von TROPFKE angeführten Stellen ist *formula* = *descriptio* (Figur, Tabelle), d.h. ein direktes Deminutivum von *forma*. Man vergleiche z. B. S. 71, Z. 27 ("Disponatur

(36) *Cours de mathématiques*, I, Paris 1860, S. 187.

(37) *Grand dictionnaire universel du XIX^e siècle*, VIII, Paris 1872, S. 616.

(38) Der zweite Einzelfall kommt natürlich in der reinen Mathematik nicht vor; aber auch die Formeln der mathematischen Physik fügen sich ohne Mühe in die Definitionen D'ALEMBERTS und LAGRANGES hinein. (So ist z.B. die Formel v = at eine regelrechte "indication des opérations qu'il faudrait effectuer sur les données pour en former l'inconnue", sobald wir uns z.B. a und t als gegeben denken). Auch die "Identitätsformeln" lassen sich auf die nämliche Weise auffassen.

enim superpartientis haec formula" — folgt eine tabellenartige Anordnung der Zahlen 9, 15, 25) mit Z. 20-21 ("... duplex sesquitertius invenitur, ut subiecta descriptio docet" — folgt wieder eine tabellenartige Anordnung der Zahlen 9, 12, 16 bezw. 9, 21, 49) und mit Z. 1-2 ("... superquadripartiens statim quantitas procreabitur, ut est ea forma, quam subpositam vides" — folgt auch hier eine tabellenartige Anordnung der Zahlen 25, 20, 16 bezw. 25, 45, 81). Dass die beiden Worte Synonyme sind, giebt BOËTIUS selbst in der Vorrede deutlich zu erkennen (S. 5, Z. 3-4 : "... ut aliquando ad evidentiam rerum nostris etiam formulis et descriptionibus uteremur"). Auf diese Weise wird das Wort von den besten Kennern des antiken Lateins, d.h. von den Altphilologen verstanden. In dem monumentalen *Thesaurus Linguae Latinae* werden sämtliche Stellen, wo dasselbe in der *Arithmetik* und in der *Musik* von BOËTIUS vorkommt, entweder unter dem Titel "*formula*, idem quod figura mathematica, descriptio", oder unter dem Titel "*formula*, idem quod tabula" untergebracht (39). Der moderne Fachausdruck *formula* = *Formel* hat also mit der *Arithmetik* von BOËTIUS nichts zu tun (40).

Der zweite von TROPFKE hinangezogene Mathematiker ist der Franzose ORONTIUS FINAEUS († 1555). Seine *Geometria Practica* (1544) ist mir z.Z. nicht zugänglich, so dass ich die Angabe von TROPFKE nicht direkt nachprüfen kann, FINAEUS gebrauche das Wort *formula* in der Bedeutung "Rechenaufstellung, Rechenschema". Ich bezweifle jedoch die Richtigkeit jener Angabe aus dem Grunde, dass sich FINAEUS in seinem posthumen Werke *De rebus mathematicis hactenus desideratis* (Lutetiae 1556, in folio) des Wortes ganz in dem Sinne von BOËTIUS bedient. Zwei Stellen scheinen freilich dagegen zu sprechen : Lib. II, prop. 15

(39) *Thesaurus Linguae Latinae*, VI, Lipsiae 1912-1926, Sp. 1114 Z. 25-65. In denselben Bedeutungen kommt das Wort *formula* in dem Spätlatein auch sonst vor, so z.B. bei APULEIUS und CHALCIDIUS.

(40) Auch nicht in der Beziehung (wie man es vielleicht vermuten könnte), dass sich die Deminutivform *formula* zuerst bei BOËTIUS finde. Sie gehört vielmehr zu dem Wortschatze des klassischen Lateins. Eine abundante Dokumentation in dieser Hinsicht, und zwar für die verschiedenartigen Bedeutungen, welche das Wort bei den Klassikern besitzt, bringt der Artikel *Formula* im *Thesaurus Linguae Latinae*, *a.a.O.* Sp. 1113-1117. Vgl. auch A. FORCELLINI, *Totius latinitatis lexicon*, III, Prati 1865, S. 124-125.

(fo. 80 recto): "Supradictarum supputationum compendiosa formula" und Lib. II, prop. 16 (fo. 82 verso): "Antecedentis calculi summaria formula"; auf den ersten Blick ist man versucht den einen und den anderen Ausdruck durch "Kurze Formel für die vorangehenden Rechnungen" zu übersetzen. Sieht man jedoch näher zu und nimmt man die anderen Stellen zu Hilfe, an denen das Wort *formula* in dem Werke vorkommt (Lib. I, prop. 9, fo. 26 verso zweimal; Lib. II, prop. 1, fo. 32 recto; Lib. II, prop. 13, fo. 68 verso), so bemerkt man, dass es überall und ausschliesslich zur Einführung einer Zahlentabelle diene. Uebrigens gebraucht FINAEUS ausdrücklich das Wort *tabella* als Synonym von *formula*; man vergleiche z. B. fo. 32 recto ("uti subscripta numerorum videtur indicare formula") mit fo. 79 recto ("quemadmodum in subscripta numerorum tabella continetur"). Und auch die beiden oben aus Lib. II, prop. 15-16 angeführten Ausdrücke finden sich in den Ueberschriften von zwei Zahlentabellen, welche die im Texte weitläufig durchgeführten Rechnungen kurz und bündig wiederholen; man muss sie also richtig mit "Kurze Tabelle (Zusammenfassung) der vorangehenden Rechnungen" übersetzen. In dem gleichfalls posthumen Werke von FINAEUS, *De re et praxi geometrica* (Lutetiae 1556, in quarto), habe ich das Wort *formula* nur an zwei Stellen gefunden, die beide zu Lib. II, c. 4 gehören (fo. 29 verso und fo. 30 recto). Gewisse im Texte durchgeführte Multiplikationen werden hier in die tabellarische Form gebracht und die Kolonnen der beiden Tabellen tragen die Ueberschriften: "Prima formula. Secunda. Tertia. Quarta."; die erste Tabelle besitzt ausserdem eine fünfte Kolonne mit der Ueberschrift: "Formula inventionis quadratae radicis". Mit einer "Formel für die Berechnung der Quadratwurzel" hat jedoch die Sache nichts zu tun; die Kolonne enthält einfach die Berechnung von $\sqrt{576}$. Die beiden Tabellen sind eingeführt durch die Worte: "quemadmodum succedentes videntur indicare formulae" bezw. "veluti subscriptae et in maiorem singulorum elucidationem adiunctae formulae manifestant", ganz ähnlich wie in *De rebus mathematicis* bezw. in der *Arithmetik* von BOËTIUS.

Was SCHEYBL († 1570) anbelangt, so benutze ich sein Werk u. d. T. *De numeris et diversis rationibus seu regulis computationum opusculum*, Lipsiae 1545, welches die erste Bearbeitung des von

TROPFKE angeführten, mir aber nicht zugänglichen *Compendiums* (1549) zu sein scheint. In dem dicken Oktavbändchen vermochte ich das Wort *formula* nur zweimal zu entdecken: Tract. I, c. 5 (fo. D_6 verso): "Alia divisionis formula" (vgl. das Zitat TROPFKES) und Tract. V (fo. e_3 recto): "Hoc et alia huius formulae exempla aliqua ex parte probari possunt per regulam quinque quantitatum" usw. An der ersten Stelle besitzt es die Bedeutung: "(schriftliche) Anordnung (der Zahlen bezw. der Division)", ganz ähnlich wie bei BOËTIUS; an der zweiten Stelle die Bedeutung: "Art, Gattung, Beschaffenheit, Gestalt". Besonders an der zweiten Stelle würde es absolut nicht gehen, dasselbe durch "die Methode, die Vorschrift, die Regel" zu übersetzen. An den beiden Stellen könnte man *formula* durch *forma* ersetzen, ohne den Sinn zu ändern.

Kehren wir jetzt zu VIRDUNG zurück. Wie bereits erwähnt, kommt das Wort *formula* in seinen *Tabulae Resolutae* mehrere Male vor (fo. 9 verso, 22 verso, 23 recto, 28 recto, 34 recto, 39 verso, 44 verso). An allen Stellen könnte man es durch das Wort *forma*, aber auch durch das Wort *regula* ersetzen; vgl. z.B. fo. 22 verso: "Caeterum quia haec supputatio nondum satisfacit perito calculi,formulam accuratius aequationem inquirendi praescribamus"; fo. 39 verso: "In praesentia nos communem sequentes opinionem tradamus formulam, qua facile et motum octavae sphaerae et augium stellarumque fixarum e *Tabulis* petas". Mit einer Figur, einer Tabelle, einer Gattung oder Beschaffenheit steht das Wort *formula* bei VIRDUNG in keinem Zusammenhange; er hat es offenbar nicht aus BOËTIUS entlehnt.

Sollten also auch bei FINAEUS oder SCHEYBL gewisse Ansätze für die spätere Bedeutungsentwicklung des Wortes *formula* innerhalb der Mathematik vorliegen (was ich persönlich für ausgeschlossen bezw. für höchst unwahrscheinlich halte), so sind sie jedenfalls durch VIRDUNG nicht nur chronologisch, sondern auch inhaltlich überholt worden. In der Terminologie VIRDUNGS bedeutet das Wort tatsächlich "ein (allgemeines) Rechenschema", "eine Vorschrift", "eine zu befolgende Regel", welche durch eine Reihe von bestimmten Rechnungsoperation von dem Gegebenen zu dem Unbekannten führt. So lautet z.B. die *formula* auf fo. 22 verso: "Ut igitur initio centri aequationem recolligas, ingreditor in *Tabulam centrorum* cum medio motu Martis... Iam perge ad aequationem proxime maiorem... aufer minorem

de maiori... Porro hanc aequationum differentiam... multiplicari iam oportet... per residuas fractiones in medio motu Martis" usw.

Uebrigens ist VIRDUNG keineswegs der erste gewesen, der die Gleichung *formula* = *regula* im allgemeinen aufgestellt hat. Unter der Ueberschrift "*formula*, fere idem quod regula, praescriptum, norma" führt der *Thesaurus Linguae Latinae* (41) eine ganze Reihe von Belegstellen aus dem Altertum an. So schreibt z.B. CICERO *De officiis* lib. III, c. 4, § 19-20 : "... formula quaedam constituenda est, quam si sequemur in comparatione rerum, ab officio numquam recedemus. Erit autem haec formula Stoicorum rationi disciplinaeque maxime consentanea" usw. Bei VIRDUNG stammt also das Wort, unmittelbar oder mittelbar, aus der Lektüre der Klassiker (nicht aber des BOËTIUS) her. Hat er es vielleicht zum ersten Male in Krakau kennengelernt, als er hier unter ALBERTUS DE BRUDZEWO, dem Freunde des Humanisten KONRAD CELTES, studierte? (42)

Krakau (Polen). ALEXANDER BIRKENMAJER.

(41) *A.a.O.* Sp. 1114 Z. 69 — Sp. 1115 Z. 24.

(42) Dass das Wort, an und für sich, bei den Krakauer Astronomen jener Zeit im Gebrauch gewesen sei, beweist der Zeitgenosse VIRDUNGS, MARTINUS BIEM aus Olkusz († 1540), welcher in der Vorrede zu seiner im J. 1516 verfassten *Nova Calendarii Romani Reformatio* folgendes schreibt (ed. L. BIRKENMAJER, Cracoviae 1918, p. 2 lin. 33-35) : "Quae quidem non ut decuit,... sed ut potui, in brevem hanc formulam redegi". Freilich besitzt es an dieser Stelle die ursprüngliche Bedeutung (Deminutivum von *forma*).

Thirty-Sixth Critical Bibliography

of the

History and Philosophy of Science and of the History of Civilization

(*to October* 1932)

This thirty-sixth Bibliography contains about 675 items, some of which have been kindly contributed by the following scholars :

L. Guinet (Brussels)
E. Honigmann (Breslau)
C. A. Kofoid (Berkeley, Cal.)
C. D. Leake (San Francisco)
E. O. v. Lippmann (Halle a.S.)
S. P. Lucia (San Francisco)
M. Meyerhof (Cairo)
J. R. Partington (Wembley, England)
J. Pelseneer (Brussels)
L. Sapin (Brussels)
M. C. Welborn (Cambridge, Mass.).

It includes the seventeenth series of addenda and errata to the *Introduction to the History of Science*, vols. 1 and 2. (Baltimore and London, 1927 and 1931.)

Papers and books sent to the Editor are entered in this bibliography if they are relevant to its purpose. They may be the object of analytical notes or longer reviews, if this seems sufficiently necessary and the services of competent scholars are available. It is obvious that only a small number of publications can be adequately reviewed and that it is not even possible to give a brief description of each and every one. However, our classification is so comprehensive and so minute, that even if we do nothing but give the accurate title of an item and put it in the proper place, we are already rendering a real service to the author, the publisher and the learned public. There is no relation between the importance of a publication and the length of the note devoted to it.

The ultimate aims of this undertaking are : (1) to establish the History of Science as an independent discipline ; (2) to demonstrate inductively the Unity of Knowledge and the Unity of Mankind ; (3) to serve as

a center of information and rallying ground to the scholars engaged in our studies.

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Cambridge, Massachusetts.

GEORGE SARTON.
ALEXANDER POGO.
October 24, 1932.

PART I

FUNDAMENTAL CLASSIFICATION (CENTURIAL)

Vth Century B.C.

Momigliano, Arnoldo. Sul pensiero di ANTIFONTE il sofista. *Riv. di filosofia*, 8, 129-40, 1930. ISIS

Szczygiel, Paul. Das Buch Job, uebersetzt und erklaert. VIII+258 p. Bonn, HANSTEIN, 1931. ISIS

Reviewed by SOLOMON GANDZ, *Isis*, 18, 193-95, 1932.

IVth Century B.C. (whole and first half)

Momigliano, Arnoldo. Ideali di vita nella sofistica : IPPIA e CRIZIA. *Cultura*, 9, 321-30, 1930. ISIS

IVth Century B.C. (second half)

Manquat, Maurice. ARISTOTE, naturaliste. 128 p. (*Cahiers de philosophie de la nature* publiés par REMY COLLIN et ROLAND DALBIEZ, V). Paris, VRIN, 1932. (10 fr.) ISIS

Étude d'ensemble sur le texte de la zoologie aristotélicienne et ses sources. Malheureusement l'auteur n'a pas fait usage de travaux modernes importants, surtout ceux de CHARLES SINGER (par exemple, Greek biology and its relation to the rise of modern biology, 1921 ; *Isis*, 4, 380) et il a omis de dire les choses essentielles. Son livre est donc tout à fait insuffisant. G. S.

IInd Century B.C. (second half)

Bergsträsser, G. Neue Materialien zu ḤUNAIN IBN IsḤĀQ's GALEN-Bibliographie. 108 p. (*Abhandlungen für die Kunde des Morgenlandes*, XIX. Bd., Nr. 2). Leipzig, 1932. ISIS

Important supplement to BERGSTRAESSER's publication of ḤUNAIN's bibliography of GALEN (Leipzig, 1925) of which we published an elaborate account by MAX MEYERHOF (*Isis*, 8, 685-724, 1926). BERGSTRAESSER's edition was based on a single MS. (Aya Sofia 3631); but since then H. RITTER found

a second MS. in the same library (Aya Sofia 3590) containing an additional text dealing with the authentic works not included in GALEN's *Pinax* and with Galenic apocrypha (see *Isis*, 13, 146). This additional text is here edited and translated into German; it is relatively short (117 lines). It is a new and impressive testimony to ḤUNAIN's high standards of scholarship. I hope to be able to publish an analysis of it. G. S.

✓ **Walsh, Joseph.** Refutation of ILBERG as to the date of GALEN's birth. *Ann. Med. Hist.*, 4, 126-46, 1932. ISIS

The late Professor JOHANNES ILBERG, the Leipzig authority on GALEN, had proposed (*Arch. f. Gesch. d. Med.*, 23, 289, 1930) the summer of 129 as the date of GALEN's birth, in disputing WALSH's contention that GALEN was born on or about September 22, 130 (*Ann. Med. Hist.*, 1, 378, 1929). WALSH wrote the present article as a personal letter to Prof. ILBERG, to whom he acknowledges his heavy indebtedness with deep respect, but since the letter did not reach its destination until too late it is published here in deference to Prof. ILBERG's memory. It is an excellent critical discussion of many important events in GALEN's life, and concludes with a valuable chronology of GALEN's life. C. D. L.

IVth Century (whole and first half)

Forke, Alfred. KO HUNG, der Philosoph und Alchemist. *Arch. f. Geschichte der Philosophie*, 41, 115-27, 1932. ISIS

Pappos of Alexandria. Commentaires de PAPPUS et de THÉON D'ALEXANDRIE sur l'Almageste. Texte établi et annoté par A. ROME. Tome 1. PAPPUS D'ALEXANDRIE. Commentaire sur les livres 5 et 6 de l'Almageste. LXXII+316 p., 43 fig. Rome, Biblioteca Apostolica Vaticana, 1931. (L. 50). ISIS

A mon retour d'Orient (Sept. 1932), j'ai trouvé sur ma table parmi beaucoup d'autres livres cette édition si longtemps attendue. Il m'est matériellement impossible de l'examiner tout de suite avec autant de soin que je le voudrais, mais je ne veux pas différer plus longtemps l'annonce de cette publication importante à nos lecteurs. Le commentaire de PAPPOS sur le V^e^ livre de l'Almageste avait été édité à Bale en 1538 par CAMERARIUS avec une préface de GRYNAEUS, sur la base d'un MS. qui se trouve encore à Nuremberg, celui même que BESSARION avait donné à REGIOMONTANUS; le commentaire sur le VI^e^ livre était encore inédit. Les prolégomènes de l'abbé ROME contiennent des notes sur PAPPOS, ses œuvres, et surtout son commentaire sur l'Almageste, les MSS. utilisés, etc. Le savant éditeur y a ajouté un mémoire sur le mode d'emploi des tables astronomiques de PTOLÉMÉE (43 p.) et sur les tables faciles des parallaxes (*πρόχειροι κανόνες*) que devront étudier tous ceux qui s'intéressent à l'astronomie grecque. Aux renseignements nouveaux sur PAPPOS il faudrait ajouter la publication d'une nouvelle édition de son commentaire sur le livre X d'EUCLIDE avec traduction anglaise et notes par GUSTAV JUNGE et WILLIAM THOMSON (Cambridge, Mass., 1930; *Isis*, 16, 132-36).

L'abbé ROME a été naturellement amené à vouloir déterminer plus exactement l'époque de l'activité de PAPPOS. Divers indices tendent à prouver que PAPPOS écrivit probablement son Commentaire sur l'Almageste un peu après 320. D'autre part, d'après HULTSCH, la rédaction de la Collection mathématique serait postérieure à celle de ce Commentaire, puisque des passages de celui-ci sont insérés dans la Collection. L'abbé ROME pense que ces passages sont des interpolations ultérieures, mais il partage l'opinion de HULTSCH quant à la postériorité de la Collection. Il semble donc qu'il vaudrait mieux placer PAPPOS dans la première moitié du IV^e^ siècle que dans la seconde moitié du III^e^ comme je l'ai fait (*Introduction*, I, 337).

Cette édition mérite un examen approfondi et je donnerai volontiers mon exemplaire au savant qui voudra bien l'entreprendre pour *Isis*.

G. S.

IVth Century (second half)

Deferrari, Roy Joseph ; Campbell, James Marshall. A concordance of PRUDENTIUS. IX+833 p. (*The Mediaeval Academy of America*, publication no. 9.) Cambridge, Mass., 1932. ISIS

Wellmann, Max. Der Physiologos. Eine religionsgeschichtlich-naturwissenschaftliche Untersuchung. 116 p. (*Philologus*, Supplementband XXII, Heft 1.) Leipzig, DIETERICH, 1930. ISIS

Important memoir which throws much new light on the subject. The author's studies on TIMOTHEOS OF GAZA, the *Cyranides*, the *Physica* of PSEUDO-SOLOMON, HORAPOLLON, BOLOS-DEMOCRITOS, ANAXILAOS OF LARISSA, DIDYMOS, etc. have led him to the conclusion that the date of the *Physiologos* is not the end of the second century (as in my *Introduction*, I, 300), but rather sometime between 254/55 (ORIGEN's death) and 380, probably c. 370, and that it was composed not in Egypt but in Palestine. Says he (p. 13) : " Wenn also der, wie ich mit KRAUS glaube, um 370 entstandene Physiologus die Schule des ORIGENES zur Voraussetzung hat, so ist er *nicht* in Alexandreia, sondern in Caesarea entstanden, in demselben Caesarea, das gegen Ende des 4. Jahrhunderts die Pseudoclementinischen Schriften hervorgebracht hat." Like everyone of WELLMANN's papers, this one is so rich that it does hardly bear analysis. G. S.

Vth Century (whole and first half)

Mesrop (*Introduction*, I, 397). 1 p. 397 u. öft. : Statt ST. MESROP ist jetzt MASHTHOTZ, wie in Ihrer Anmerk. zu schreiben; dazu : MARQUART (MARKWART), JOS. : Ueber den Ursprung des armenisch. Alphabets in Verbindung mit der Biographie des heil. MAŠT'OC'. Wien 1917 : Mechitharisten-Buchdruckerei. VI, 60 S. (Studien zur armenischen Geschichte). PEETERS, P. : Pour l'histoire des origines de l'alphabet arménien, dans : *Revue des études arméniennes*, 9, 203-27, 1929. E. H. ISIS

Vth Century (second half)

Thios. Note to be added to *Introduction* (I, 407). THIUS, griech. Astronom, von dem 7 Beobachtungen aus den Jahren 475-510 n. Chr. am Ende der anonymen *προλεγόμενα τῆς μεγάλης συντάξεως* im Ms. Paris, Bibl. Reg. CXIV zitiert werden, excerpiert bei ISMAEL BULLIALDUS (BOUILLAUD) Astronomia philolaica, Parisiis 1645 ; die einzelnen Beobachtungen : anno 475 (p. 172), 498 (p. 278), 503 (p. 326), 508 (p. 246), 509, 2 März (p. 172), 509, 13 Juni (p. 327), 510 (p. 346) ; p. 278 : *τοῦ θείου τήρησις*. E. H. ISIS

VIth Century (whole and first half)

Cooper, Lane. A concordance of BOETHIUS ; the five theological tractates and the Consolation of philosophy. XII+467 p. (*The Mediaeval Academy of America*, publication no. 1). Cambridge, Mass., 1928. ISIS

Damascios (*Introduction*, I, 421). KOPP's edition is incomplete, the first complete edition being that of RUELLE, Paris, 1889, the additions occupying almost as much space as the part printed by KOPP. A careful French translation, with useful notes, by A. E. CHAIGNET, 3 vols. Paris, 1898, should have been mentioned. Although DAMASKIOS is " hair splitting " to some modern tastes, his work contains valuable fragments of old Orphic systems. J. R. P. ISIS

VIIth Century (second half)

Ananias, Armenian astronomer. (Note to be added to *Introduction*, I.) 2. (?) Hälfte des 7. Jahrhunderts : ANANIA SHIRAKATZI (ŠIRAKAC'I), auch ANETZI oder HAMAROGH : Mathematiker und Astronom (Plan einer Reform des armenischen Kalenders), übers. PAULUS ALEXANDRIN. Einl. in die Astrol. ins Armen. etc., vgl. F. TOURNEBIZE : Ananie de Chirak, in : *Dict. d'hist. et de géogr. ecclés.* II, 1432-3, 1914. Nach dem Vorgange von Patkanean pflegt man ihm jetzt allgemein die Geographie des Ps.-MOSES CHORENATZI zuzuschreiben, vgl. MLAKER in : *Armeniaca*, fasc. II, Leipzig, 122, 1927. E. H. ISIS

Sengupta, Probodhchandra. BRAHMAGUPTA on interpolation. *Bull. Calcutta Math. Soc.*, 23, 125-28, 1931. ISIS

IXth Century (whole and first half)

(al-Ḥajjāj ibn Yūsuf ibn Maṭar). Codex Leidensis 399, 1. Euclidis

elementa ex interpretatione AL-HADSCHDSCHADSCHHII cum commentariis AL-NARIZII. Arabice et latine ediderunt notisque instruxerunt G. JUNGE, J. RAEDER, W. THOMSON. Partis III fasciculus II. 215 p. In Libraria Gyldendaliana, Hauniae, 1932. ISIS

Continuation of the publication begun by R. O. BESTHORN and J. L. HEIBERG in 1893. It is a translation of EUCLID into Arabic by AL-ḤAJJĀJ (first half of the ninth century) together with notes by ABŪ-L-'ABBĀS AL-FAḌL IBN ḤĀTIM AL-NAIRĪZĪ (second half of the ninth century). See my *Introduction*, I, 562, 598, and passim. The present instalment contains books V and VI, and the initial lines of book VII, the Leiden MS. stopping abruptly at this point. The Arabic text was edited and translated into English by WILLIAM THOMSON; G. JUNGE reviewed this version from the mathematical point of view, J. RAEDER translated the English into Latin. It should be noted that this Arabic text was translated into Latin by GERARD OF CREMONA (see my *Introduction*, 2, 341) but the new Latin text is different from GERARD's text edited by M. CURTZE, as supplement to HEIBERG and MENGE's edition of EUCLID (Leipzig, 1899). For example, some sentences were omitted by GERARD. G. S.

IXth Century (second half)

Bergsträsser, G. Neue Materialien zu ḤUNAIN IBN ISḤĀQ's GALEN-Bibliographie. 108 p. (*Abhandlungen für die Kunde des Morgenlandes*, XIX. Bd., Nr. 2). Leipzig, 1932. ISIS

See note classified above under IInd century (second half). G. S.

Bessel-Hagen, E.; Spiess, O. THĀBIT B. QURRA's Abhandlung über einen halbregelmässigen Vierzehnflächner. *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*, Abteilung B. Studien, 2, 186-98, 2 fig., 1932. ISIS

Xth Century (whole and first half)

Lévi-Provençal, E. L'Espagne musulmane au X^e^ siècle. Institutions et vie sociale. 272 p., 24 pl., 1 carte, Paris, LAROSE, 1932. ISIS

Ouvrage important qui complète le travail à peine amorcé par DOZY dans sa magistrale *Histoire des Musulmans d'Espagne*. Il présente un grand intérêt lexicographique car il contient plusieurs définitions nouvelles ou plus précises de termes arabes bien indexés. G. S.

Mubârak, Zaki. La prose arabe au IV^e^ siècle de l'Hégire (X^e^ siècle). 285 p. Paris, MAISONNEUVE, 1931. ISIS

Reviewed by C. BROCKELMANN, *DLZ*, 3, 777-78, 1932.

Stapleton, H. E.; Husain, M. Hidayat. Report on the Mā'al-Waraqī. *Archeion*, 14, 73-75, 1932. ISIS

Cette communication, faite au deuxième Congrès d'histoire des sciences, Londres, 1931, relate que le Ms. arabe de la bibliothèque de Luknow intitulé Mā'al-Waraqī wa-l-Ard Najmīyah (Eau d'argent et terre étoilée), de MUḤAMMAD IBN UMAIL, a un contenu très voisin des *Tabula chimica* de Senior ZADITH. L. G.

Xth Century (second half)

Vera, Francisco. El matemático madrileño MASLAMA BENAHMED. Notas para una biobibliografia. *Revista de la Biblioteca, Archivo y Museo del Ayuntamiento* de Madrid, 17 p., Madrid, 1932. ISIS

General study on ABŪ-L-QĀSIM MASLAMA IBN AḤMAD AL-MAJRĪṬĪ (*Introduction*, I, 668), with bibliography. G. S.

XIth Century (second half)

Millàs Vallicrosa, José. Estudios sobre AZARQUIEL. 1. El tratado de la azafea. 31 p. *Annales de la Universidad de Madrid*, 1, 1932. ISIS

Important study on AL-ZARQALI's treatise on the saphaea which I am unable to discuss now (while I am traveling) but which must be brought to our readers' attention as promptly as possible. It will suffice for the present to indicate its contents : La obra bibliográfica de STEINSCHNEIDER. Reparos de STEINSCHNEIDER sobre la autenticidad de la traducción española del tratado de la azafea de AZARQUIEL. Crítica de estos reparos. Dualidad de textos árabes del tratado de la azafea de AZARQUIEL. Carácter resumido del segundo de estos textos. Traducciones que derivan de cada uno de los textos arabes. Carácter literal de la traducción alfonsina. ¿ Hubo redacción árabe del tipo de la azafea *almemonía?* Relación entre la *lámina universal* inventada en Toledo y la azafea de AZARQUIEL. Paternidad de la *lámina* a favor de ALÍ BEN JÁLAF; identificación de este autor. La cuestión de los precedentes de la lámina universal. Recensiones y derivaciones del tratado de la azafea de AZARQUIEL. El tratado de la lámina universal de HOSAIM EL ISLAMÍ; la recensión atribuída a GUILLELMUS ANGLICUS : sus problemas. ¿ Colaboró en esta recensión JUDÁ BAR MOSÉ HACOHÉN? Modificaciones que presenta esta recensión. Alusiones y extractos del tratado de la azafea de AZARQUIEL en una *Noua compilatio astrolabii*. Un ejemplar de azafea árabe en la Academia de Ciencias de Barcelona. Apéndice. G. S.

XIIth Century (whole and first half)

(Abraham bar Ḥiyya). ABRAAM BAR HIIA. Llibre de geometria. Hibbur hameixihà uebatixbòret. Segons el text editat i prologat pel MIQUEL GUTTMANN. Versió de l'Hebreu per J. MILLÀS I VALLICROSA. XXIX+152 p. (*Biblioteca Hebraico-Catalana*, 3). Barcelona, Alpha, 1931 (10 Ptes). ISIS

Professor MILLÀS I VALLICROSA gave us a few years ago a Catalan translation

of the Megillat ha-megalleh (Barcelona, 1929; *Isis*, 14, 476). We owe him now a more precious gift, this Catalan version of the Ḥibbur hameshihah ve-ha-tishboret, that is, the *Liber embadorum*, one of the most important mathematical books of the Middle Ages. (See my *Introduction*, 2, 207). His translation is based upon the Hebrew text edited by GUTTMANN for the Meqize nirdamim (Berlin, 1912). The Catalan introduction is partly derived from GUTTMANN's but the author has added his own commentary. This is, I believe, the first publication of the Ḥibbur in any Western language excepting of course the Latin version made by PLATO OF TIVOLI in 1145 and edited by M. CURTZE in 1902, which it should be noted (I failed to do so in my *Introduction*, 2, 178) is not a complete version but an abbreviated one. Fragments of PLATO's version are given in appendix (p. 143-47). The author is quoted on the title page as being professor of Hebrew in the University of Madrid; however, since the publication of this book he has been appointed to the chair of Hebrew and Arabic in the University of Barcelona. G. S.

Bologna, University of. (*Introduction*, II, 351). Erwähnenswert, aber erst für spätere Zeit, vielleicht : Deutsche Studenten in B. (1289-1562). Biogr. Index zu d. Acta Nationis Germanicae Univ. Bonon. Im Auftr. d. K. Preuss. Akad. d. Wiss. bearb. v. GUSTAV C. KNOD. xxv+766 p. Berlin, DECKER, 1899. E. H. ISIS

Matthew of Edessa. (*Introduction*, II, 251). MATTHĒOS URHAYETSI : neuere und bessere Ausg. Edžmiacin (Walaržapat) 1898. E. H. ISIS

Muḥammad al-Zuhrī (*Introduction*, II, 221). al-Zuhrī wohl aus al-Zuhra = Port Vendres in der Nähe der spanischen Grenze. E. H. ISIS

Munro, Dana C. ; Haagensen, Cushman D. A note on the treatment of cardiac disease in the twelfth century. *Ann. Med. Hist.*, 4, 87-90, 1932. ISIS

An account of the ineffectual treatment of cardiac decompensation in ALEXIUS I, Byzantine Emperor (1081-1118) by means of exercise, phlebotomy, pepper, and the cautery. The note is taken from The Alexiad of Princess ANNA COMNENA : Being the history of the reign of her father, ALEXIUS I, Emperor of the Romans, translated by ELIZABETH A. S. DAWES, London, KEGAN PAUL, 1928. C. D. L.

Nicephoros Bryennios. (*Introduction*, II, 250). SEGER, JOHANNES : Byzantinische Historiker des X. und XI. Jahrhunderts, I : NIKEPHOROS BRYENNIOS. Eine hist.-philol. Untersuchung. v+58 p. Diss. München, HOYER, 1888. E. H. ISIS

Renaud, H. P. J. Trois études d'histoire de la médecine arabe en

occident. *Hespéris*, 135-50, 1930; facs., 91-105; facs., 204-28, 1931. ISIS

I. Le Musta'īnī d'IBN BIKLĀRISH (voir mon *Introduction*, 2, 235). « Nous avons affaire ici à une œuvre de la bonne époque, dépourvue des longueurs, et notamment des citations pieuses qui caractérisent, avec la place prépondérante prise progressivement par la thérapeutique magicomédicale, les productions des siècles suivants. Si le plan de l'ouvrage ne permet pas les longs développements qui restent l'apanage du *Traité des simples* d'IBN AL-BAYṬĀR, nous trouvons dans le *Musta'īnī*, sous une forme concise et précise, des renseignements de valeur analogue. Si le médecin juif de Saragosse ne semble pas avoir été le grand voyageur et botaniste que fut le médecin musulman de Malaga, la richesse de ses documents linguistiques montre que lui aussi sut observer et enquêter. Le chiffre élevé des mots berbères, appartenant aux divers dialectes du Magrib, qu'il a recueillis, venant certainement de nombreux interlocuteurs, en fournit à lui seul la preuve ».

II. Nouveaux MSS. d'AVENZOAR.

III. Une suite à l'*Urjūza* d'AVICENNE sur la médecine. Le poème d'IBN 'AZRŪN et ses commentateurs. Cet auteur est à peu près inconnu. Peut-être est-il identique au juriste et littérateur de Murcie, cité sous un nom un peu différent par IBN AL-ABBĀR et qui vécut de 1117 à 1168. Quoiqu'il en soit son poème a été l'objet de nouveaux commentaires. L'auteur étudie spécialement le dernier en date de ceux-ci, notamment le Jardin secret (Al-rawḍ al-maknūn fī sharḥ rajaz IBN 'AZRŪN) composé par ABŪ MUḤAMMAD AL-QĀSIM IBN MUḤAMMAD AL-GHASSĀNĪ, médecin marocain de la seconde moitié du XVI^e siècle. G. S.

Schiffmann, S. JEHUDA HALEVI (1086-1142), physician and poet. *Med. Journ. & Rec.*, 135, 299-301, 1932. ISIS

A Spanish Jew, HALEVI is best known for his religious fervor, expressed well in The dialogue of the Chozari (1141?).

Theophile the Priest. (*Introduction*, II, 219). A much better edition (text and translation) than ILG's is ROBERT HENDRIE's An essay upon various arts in three books by THEOPHILUS called also RUGERUS Priest and Monk, forming an Encyclopaedia of Christian art of the eleventh century. Translated, with notes, by ROBERT HENDRIE, London, Murray, 1847. This takes account of the Vienna Ms. used by ILG, also the Paris Ms. and the important early Harleian Ms. 3915 (twelfth to thirteenth century) of the British Museum, which is more complete than those used by continental editors (ILG, and C. DE L'ESCALOPIER, Paris, 1843; another French translation was published in 1924). The name RUGERUS has Ms. authority.

J. R. P. ISIS

XIIth Century (second half)

Eustathius of Thessalonica (*Introduction*, II, 395). KNAUSS, GUILEL-

MUS : De STEPHANI BYZANTII ethnicorum exemplo EUSTATHIANO. 114 p. Diss. Bonn, Georgi, 1910. KALITSUNAKIS, JOHANNES E. : Mittel- und neugriech. Erklarungen bei EUSTATHIUS. 113 p. Berlin, Ver. Wiss. Verl. 1919 (S.-A. aus *Mitteil. d. Seminars f. Oriental. Sprachen*, Bd. 12, 170-93, 1909 ; 13, 91-106, 1910 ; 16, 99-112, 1913 ; 22, 127-85, 1919. E. H. ISIS

al-Ghāfiqī (*Introduction*, II, 424). The ophthalmological treatise was composed by another AL-GHĀFIQĪ, named MUḤAMMAD IBN QASSŪM IBN ASLAM, a contemporary of AḤMAD IBN MUḤAMMAD AL-GHĀFIQĪ and perhaps his relative. The oculist was mentioned by HIRSCHBERG in his history. M. M. ISIS

Herrad of Landsberg (*Introduction*, II, 389). What is probably the only surviving fragment of the lost unique Ms. of HERRAD's *Hortus deliciarum* has been recently acquired by the British Museum. See the *B. M. Quarterly*, 6, 1-3, 4 pl., 1931. G. S. ISIS

Al-Idrīsī (*Introduction*, II, 411). FURLANI, G. : La Giulia e la Dalmazia nel « Libro di Ruggero » di AL-IDRĪSĪ, in *Aegyptus*, 6, 54-78, 1925. E. H. ISIS

Manasses (*Introduction*, II, 450). Cronica lui CONSTANTIN MANASSES. Traducere medio-bulgară, făcută pe la 1350. Text și glosar de IOAN BOGDAN. Cu pref. de I. BIANŬ. Publicare postuma. VIII+ 456 p. Bucharest, Socec, 1922. I. E. KALITSUNAKIS. *Παρατηρήσεις εἰς τὸν λόγον τοῦ Μανάσση πρὸς τὸν λογοθέτην Μιχαήλ*. 7 p. Athens, SAKELLARIOS, 1909. E. H. ISIS

Munqidh, Usāmah ibn (*Introduction*, II, 446). lin. 2. Shaizar. Statt Caesarea lies Sizara (GUIL. TYR. XV 1 : Caesara) oder Larissa am Orontes. E. H. ISIS

Russell, Josiah C. Hereford and Arabic science in England about 1175-1200. *Isis*, 18, 14-25, 1932. ISIS

" Along several lines some advance in knowledge is made. The lives of ROGER OF HEREFORD and DANIEL OF MERLAI have been more precisely defined. ALFREDUS ANGLICUS has been identified with some probability as the Master ALFRED whose activity is evident about Hereford in the second half of the twelfth century. The presence of these men together with other evidence points to a cathedral school at Hereford at which the liberal arts, theology, and Arabic science were taught."

al-Sam'ānī (*Introduction*, II, 445). The Kitāb al-Ansāb of AL SAM'ĀNĪ. Reproduced in facsimile from the Ms. in the British Museum (Add.

23, 355), with an Introduction by D. S. MARGOLIOUTH, *Gibb Memorial series*, 20, 1912. E. H. ISIS

Savitz, Harry A. MAIMONIDES' hygiene of the soul. *Ann. Med. Hist.*, 4, 80-86, 1932. ISIS

XIIIth Century (whole and first half)

Aḥmad ibn al-Khalīl (*Introduction*, II, 703). Line 5, al-Tā'ūsī (?). Means perhaps " from Tā'ūsa on the Euphrates (al-Mas'ūdī, Murūj, 3, 40). E. H. ISIS

Ḥammāmāt. (*Introduction*, II, 631). Bemerkenswert ist, dass die Syrer ein öffentliches Bad einfach δημόσιον (sc. λουτρόν) nannten, was z.B. in der Uebersetzung des PS.-ZACHARIAS Rhetor von K. AHRENS-G. Krueger, 118, 5, 119, 7, Leipz., 1899, falsch mit „Regierungspalast" wiedergegeben wird. E. H. ISIS

Neidhart von Reuental. Lieder von NEIDHART (VON REUENTAL). Bearbeitet v. WOLFGANG SCHMIEDER. Revision des Textes v. EDMUND WIESSNER. IX+61 p., 25 pl. (*Publikat. d. Gesellsch. z. Herausgabe d. Denkmäler d. Tonkunst in Österreich* unt. Leitung v. GUIDO ADLER. Bd. 71). Wien, Universal-Edition, 1930. ISIS

Reviewed by HERMANN HALBIG, *DLZ*, 3, 892-96, 1932.

'Umar ibn al-'Adīm. (*Introduction*, II, 684). Weitere Teilübersetzungen bei G. W. FREYTAG Locmani fabulae, 41-46, Bonnae, 1823 ; Chrestomathia arabica, ibid. 97-138, 1834 ; Auszüge : *ZDMG* 10, 432-98 ; 11, 177-252. *Rec. Hist. Orient. Croisad.*, Hist. Arab., 3, 577-610. E. H. ISIS

Walsh, James J. Clinical medicine in the Middle Ages. BARTHOLOMEW's De proprietatibus rerum. *Medical Life*, 39, 365-82, illus., 1932. ISIS

Wulf, M. de. Courants doctrinaux de la philosophie européenne du XIII^e siècle. *R. néo-scholastique de philosophie*, 34, 5-20, 1932. ISIS

Yāqūt. (*Introduction*, II, 643). F. WÜSTENFELD : JĀCŪT's Reisen in *ZDMG*, 18, 25-40, 1864. E. H. ISIS

XIIIth Century (second half)

Darmstaedter, Ernst. ALBERTS DES GROSSEN Naturbetrachtung.

Zur Heiligsprechung des grossen Kirchenlehrers. *Natur und Kultur*, 29, 121-25, 1932. ISIS

Greenwood, Thomas. ALBERTUS MAGNUS: his scientific views. *Nature*, 129, 266-68, 1932. ISIS

Popular account adding nothing to our knowledge. No sources quoted. G. S.

Mackay, Dorothy Louise. Advertising a mediaeval university. *American Historical Review*, 37, 515-16, 1932. ISIS

University of Naples; circular letter of CHARLES I, 1272.

Paneth, Fritz. ALBERTUS MAGNUS as chemist. *Nature*, 129, 612-13, 1932. ISIS

"The article by Dr. GREENWOOD (*Nature*, 129, 266, 1932) seems to me to lay too little stress on the point that while ALBERTUS MAGNUS certainly advanced botanical and zoological science by much valuable original observation, yet in the realm of chemistry he contented himself with repetition and interpretation of earlier writings. The opposite impression given by the article seems to be due to the fact that Dr. GREENWOOD regards 'De alchimia' as authentic."

Peter of Saint Omer. (*Introduction*, II, 1041). Vieles über ihn in MARY PHILADELPHIA MERRIFIELD: Original treatises dating from the twelfth to the eighteenth centuries on the arts of painting, etc. (London, 1849), 1, 112. *De coloribus.* E. O. v. L. ISIS

Thorndike, Lynn. RUFINUS: a forgotten botanist of the thirteenth century. *Isis*, 18, 63-76, 1932. ISIS

This is a very important contribution to our knowledge of mediaeval botany. This RUFINUS studied the liberal arts at Naples and Bologna, and flourished about the year 1287, writing after that date a treatise *De virtutibus herbarum et de compositionibus earum*, represented by a Ms. in the Laurentian library of Florence. THORNDIKE analyzes that treatise and quotes many fragments of it in English. According to RUFINUS' own statement his main authorities were DIOSCORIDES, the *Circa instans*, MACER, ALEXANDER THE PHILOSOPHER, the masters of Salerno, ISAAC, and the Synonyms. "But presently we observe that, after the authors have been cited, there come at the end of the treatment of the herb in question a few lines introduced by the word, RUFINUS. Or sometimes no authors at all are cited for an herb. Or the only name mentioned is RUFINUS. And finally we realize that many herbs are discussed which were treated not merely by only one or two of the seven authorities, but which had not been mentioned by them at all. It is in these modest additions to his authors and the filling in of gaps where authorities were totally wanting that RUFINUS' contribution to the science as well as to the literature of botany consist." (p. 65). Some plants are very carefully described, witness the examples quoted. His work

is independent from the *De vegetabilibus* of ALBERT THE GREAT. It contains clinical as well as botanical observations. G. S.

al-'Urḍī. (*Introduction*, II, 1013). al-'Urḍī : aus 'Urḍ (Orissa ; jetzt al-Ṭaiyibe nordöstlich von Palmyra). E. H. ISIS

Vahram of Edessa. (*Introduction*, II, 1117). The unidentified journal is *Revue de l'Orient, de l'Algérie et des Colonies* (vol. 17, 245-54, 315-25, 1864). E. H. ISIS

Welborn, Mary Catherine. The errors of the doctors according to Friar ROGER BACON of the Minor Order. *Isis*, 18, 26-62, 1932. ISIS

Translation of BACON's *De erroribus medicorum* (cf. *Introduction*, II, 959), with notes, list of drugs, elaborate glossary of drugs, and list of authors. G. S.

XIVth Century (whole and first half)

Campbell, Anna Montgomery. The black death and men of learning. XII+210 p. New York, Columbia University Press, 1931. ISIS

Reviewed by C. D. LEAKE, *Isis*, 18, 195-97, 1932.

(Dante). DANTES Briefe an die Fürsten und Völker Italiens und an Kaiser HEINRICH VII. nebst der ältesten italienischen Übersetzung des Briefes an Kaiser HEINRICH VII. aus dem Cod. 101 S. Pantaleo 8 der Bibliothek Vittorio Emanuele in Rom und aus dem Cod. Marcianus latinus XIV 115 der Bibliothek von S. Marco in Venedig nebst einer Übersichtstafel zur handschriftlichen Überlieferung der DANTEbriefe im Faksimile-Druck eingel. u. hrsg. v. FRIEDRICH SCHNEIDER, 4 p., 21 pl. Zwickau, ULLMANN, 1930. ISIS

Reviewed by LUDWIG BERTALOT, *DLZ*, 3, 446-48, 1932.

(Dante). DANTIS ALAGHERII Monarchiae liber et Epistolae ex codice Vaticano Latino 1729 phototypice expressa. Praefatus est FRIDERICUS SCHNEIDER. 29 p., 33 pl. (Codices e Vaticanis selecti quam simillime expressi iussu PII PP. XI consilio et opera Curatorum Bibliothecae Vaticanae. vol. 21.) Rome, Bibliotheca Vaticana, 1930. ISIS

Reviewed by LUDWIG BERTALOT, *DLZ*, 3, 445-48, 1932.

Kürzinger, Josef. ALFONSUS VARGAS TOLETANUS und seine theologische Einleitungslehre. Ein Beitrag zur Geschichte der Scholastik im 14. Jahrhundert. XVI+230 p. (*Beiträge z. Gesch. d. Philos.*

u. Theol. d. Mittelalters. Texte u. Untersuchgn. Bd. XXII, H. 5-6). Münster i.W., ASCHENDORFF, 1930. ISIS

Reviewed by Jos. KOCH, *DLZ*, 3, 1251-53, 1932.

Loghem, J. J. Van. Montpellier en de heilige ROCHUS. *Bijdragen tot de geschiedenis der geneeskunde*, 12, 121-24, 2 fig., 1932. ISIS

The Luttrell Psalter. Two plates in colour and one hundred and eighty-three in monochrome from the manuscript now in the British Museum. With introduction by ERIC GEORGE MILLAR. x+62 p. London, KEGAN PAUL, 1932. ISIS

This famous manuscript, now adequately reproduced for the first time, was written and illuminated in East Anglia about 1340 A.D. Although portions of it are already familiar through reproduction in various works, it has never before been made accessible to students and libraries so completely as it now appears.

Thorndike, Lynn. Calculator. *Speculum*, 7, 221-30, 1932. ISIS

Vaccaro, Leopold. The medical side of DANTE. *Medical Life*, 39, 65-71, portr., 1932. ISIS

XIVth Century (second half)

Buron, Edmond. Ymago mundi de PIERRE D'AILLY, Cardinal de Cambrai et Chancelier de l'Univ. de Paris (1350-1420). Texte latin et traduction française des quatre traités cosmographiques de D'AILLY et des notes marginales de CHRISTOPHE COLOMB. Etude sur les sources de l'auteur. Tome I-III. 828 p., pl. Paris, MAISONNEUVE, 1930. ISIS

Reviewed by ERNST ZINNER, *DLZ*, 3, 40-42, 1932.

Castelnau, Jacques-Th. de. Le Paris de CHARLES V (1364-1380). 158 p., 8 pl., 1 map. Paris, HACHETTE, 1930. ISIS

Reviewed by FRIEDRICH SCHNEIDER, *DLZ*, 3, 898-99, 1932.

Fox, George G. The mediaeval sciences in the works of JOHN GOWER. v+164 p. (*Princeton Studies in English*, no. 6). Princeton, University Press, 1931. ISIS

(Froissart, J.) Chroniques de J. FROISSART, troisième livre, publié pour la Société de l'histoire de France (série antérieure à 1789) par LÉON MIROT. Tome douzième, 1356-1388. (Voyage de FROISSART en Béarn. Récits d'Espan du Lion et du Bascot de

Mauléon. Evénements d'Espagne). Paris, CHAMPION, 1931. ISIS

Reviewed by VINCENT FLIPO, *Journal des Savants*, 183-84, 1932.

XVth Century (whole and first half)

Schrade, Leo. Die handschriftliche Überlieferung der ältesten Instrumentalmusik. 119 p. Lahr, SCHAUENBURG, 1931. ISIS

Reviewed by HANS JOACHIM MOSER, *DLZ*, 3, 462-64, 1932.

XVth Century (second half)

Burgos, F. Cantera. El judío salmantino ABRAHAM ZACUT. Notas para la historia de la astronomia en la España medieval. 350 p., 9 pl. Madrid, 1931. ISIS

Leonardo da Vinci

Baumgartner, Leona. LEONARDO DA VINCI as a physiologist. *Ann. Med. Hist.*, 4, 155-71, 1932. ISIS

Excellent illustrated summary, without critical analysis or commentary, of LEONARDO's physiological ideas. C. D. L.

Vaccaro, Leopold. LEONARDO, precursor of modern medicine. *Medical Life*, 39, 73-80, portr., 1932. ISIS

XVIth Century (whole and first half)

A. — *Mathematics*

Natucci, A. Come si insegnava algebra nel secolo decimosesto. *Periodico di mat.*, 173-79, 1932. ISIS

L'auteur appuie son étude sur la sixième partie de « General trattato de' numeri et misure » de TARTAGLIA (1556-1560). L. G.

B. — *Physical sciences and technology*

Darmstaedter, Ernst. Paracelsische Auffassungen über Farben-Erscheinungen. *Acta Paracelsica*, H. 5, 121-26, 1932. ISIS

Strunz, Franz. Die Alchemie und das alchemistische Weltbild bei THEOPHRASTUS PARACELSUS. *Archeion*, 14, 76-87, 1932. ISIS

Vetter, Quido. Sur les destins du manuscrit pragois du KOPERNIK *De revolutionibus orbium caelestium libri sex*. Mémoires de la Société royale de Bohème, 21 p., 5 fig., 1931. ISIS

C. — *Natural sciences*

Biggar, Henry Percival. A collection of documents relating to JACQUES CARTIER and the Sieur DE ROBERVAL. XXXVII+577 p., index. (*Publs. Public Archives of Canada*, no. 14). Ottawa, Secretary of State, 1930. ISIS

Reviewed in *Geographical Review*, 22, 506-07, 1932.

Strunz, Franz. Mensch und Natur in der Weltanschauung des PARACELSUS. *Acta Paracelsica*, H. 4, 108-20, 1931 ; H. 5, 126-42, 1932. ISIS

D. — *Medical sciences*

Favaro, Giuseppe. JACOPO BERENGARIO nella storia dell' anatomia. Rassegna per la Storia della Università di Modena e della cultura superiore modenese, 5 p., port., 1931. ISIS

Fosseyeux, Marcel. Les traductions françaises de traités d'hygiène italiens au XVI^e^ siècle. *Bulletin de la Société française d'Histoire de la Médecine*, 25, 489-506, illus., 1931. ISIS

Olivier, G. Une statue de LIGIER RICHIER. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 153, 1932. ISIS

E. — *Alia*

Nowak, Leopold. Das deutsche Gesellschaftslied in Österreich von 1480-1550. (ARNOLD VON BRUCK, HEINRICH FINCK, WOLFGANG GREFINGER, PAUL HOFHAYMER, ERASMUS LAPICIDA, STEPHAN MAHU, GREGOR PESCHIN, JOHANN SIES, THOMAS STOLTZER.) Instrumentalübertragungen (Tabulaturen) v. ADOLF KOCZIRZ. Textrevision v. ANTON PFALZ. X+110 p., 2 pl. (*Publikat. d. Gesellsch. z. Herausgabe d. Denkmäler d. Tonkunst in Österreich* unt. Leitung v. GUIDO ADLER. 37. Jg., 2 Tl., Bd. 72). Wien, Universal-Edition, 1930. ISIS

Reviewed by HERMANN HALBIG, *DLZ*, 3, 893-96, 1932.

Pflaum, Heinz. LEONE EBREO (*Heidelberger Abhandlungen zur Philosophie und ihrer Geschichte*, 7, 42-158). Tübingen, MOHR, 1926. ISIS

Elaborate biography of the Portuguese Jew, JUDAH ABARBANEL, alias LEONE EBREO, and analysis of his only work, the *Dialoghi di amore* (composed c. 1502; printed 1535), which was exceedingly popular in the sixteenth century, witness two French translations, three Spanish ones, other translations into

Latin and Hebrew, and frequent editions. PFLAUM's memoir on LEONE EBREO is preceded by an introductory one, " Die Idee der Liebe in ihrem Wandel vom Mittelalter zur Renaissance." It is an important contribution to the study of mediaeval thought in its final stage. The author concludes (p. 145): " So wird derjenige Kulturwert, den die Renaissance (vor der eigentlichen wissenschaftlichen und philosophischen Wendung zur Natur) am intensivsten ausgebildet hat, der ästhetische, bei LEONE EBREO religiös umgeprägt. Hierin beruht das philosophiegeschichtliche Interesse der ' Dialoghi di Amore,' die das einzige Zeugnis eines jüdischen Renaissance-Denkens sind. Die Idee der Liebe als eines metaphysischen Universalprinzips ist als solche für die Philosophie nicht fruchtbar geworden; aber, wie im zweiten Kapitel dargelegt worden ist, sie stellt eine Vorstufe für die bald darauf sich entfaltende Naturphilosophie dar. Das gedankliche Gebäude, das LEONE EBREO aus dem Geiste der jüdischen Religiosität, aber mit den Baustoffen der italienischen Renaissance errichtet hat, steht mit auf der Schwelle jener grossen Pforte, durch die die abendländische Philosophie in den Vorhof des modernen Erkennens, in den gestaltenreichen Bezirk der natura universalis hereinschritt." No index! G. S.

Weil, Erich. Die Philosophie des PIETRO POMPONAZZI. *Arch. f. Geschichte der Philosophie*, 41, 127-77, 1932. ISIS

XVIth Century (second half)

D. — *Medical sciences*

Major, Ralph H. WILLIAM CLOWES (1544-1604) and his " Profitable and Necessarie Booke of Observations." *Ann. Med. Hist.*, 4, 1-11, 1932. ISIS

A surgical treatise on the treatment of powder burns and gunshot wounds, first published 1591. C. D. L.

E. — *Alia*

Herzfeld, K. F. The process of GIORDANO BRUNO. *Science*, 75, 241-42, 1932. ISIS

" BRUNO might perhaps be called a martyr to Pantheism, to Buddhism, to Unitarianism, but surely not to science."

XVIIth Century (whole and first half)

A. — *Mathematics*

Torricelli, E. Una lettera inedita di EVANGELISTA TORRICELLI. Supplemento al Carteggio di E. TORRICELLI. Con introduzione del GINO LORIA. *Archeion*, 14, 12-14, 1932. ISIS

Lettre inédite du 17 janvier 1645 à MICHELANGELO RICCI, sur la spirale de TORRICELLI.

B. — *Physical sciences and technology*

(Kepler, Johann). JOHANN KEPLER, 1571-1630. A tercentenary commemoration of his life and work. A series of papers prepared under the auspices of the History of Science Society, in collaboration with the American Association for the Advancement of Science (Sections A, D, and L). 133+XII p. Baltimore, WILLIAMS and WILKINS, 1931. ISIS

Reviewed by N. T. BOBROVNIKOFF, *Isis*, 18, 197-200, 1932.

Tiberghien, Alb. Cartes lunaires peu connues. I. *Ciel et Terre*, 45, 7 p., 1929. ISIS

Apropos of the map of 1610 by CHARLES MALAPERT (1581-1630).
A. P.

Tiberghien, Albert. Cartes lunaires peu connues. II. CLAUDE MELLAN (1634-35). *Ciel et Terre*, 48, 17 p., 1 pl., 1932. ISIS

« CLAUDE MELLAN a gravé, vers 1636 et 1637, trois planches de la Lune, d'après les observations astronomiques qui remontent à 1634 et 1635. Le Cabinet des Estampes de Bruxelles possède deux de ces planches, aujourd'hui assez rares. On ignore le sort des dessins qui ont servi de base à ces gravures. Quant aux planches gravées, il n'est pas démontré qu'on en ait tiré des épreuves avant la lettre et sans le nom du graveur. Nous ne pouvons pas considérer comme établie l'existence d'une carte de la Lune, dressée par J. D. CASSINI, et gravée par Cl. MELLAN ».

D. — *Medical sciences*

Castiglioni, Arturo. The life and work of SANTORIO SANTORIO (1561-1636). Translated from the Italian by EMILIE RECHT. *Medical Life*, 38, 729-85, illus., 1931. ISIS

Elaborate biography of the great Istrian physician, one of the greatest contemporaries of GALILEO, one of the most original scientists of his time. Followed by various documents in English translation, notes and bibliography. Many illustrations. G. S.

Moon, R. O. VAN HELMONT (1578-1644), chemist, physician, philosopher and mystic. *Proc. Roy. Soc. Med.*, 25, 23-28, 1931. ISIS

Scremin, Luigi. Padre SPE, S. J., e le streghe. *Genesis*, 11, 298-302, portr., 1931. ISIS

E. — *Alia*

Heide, Walther. Die älteste gedruckte Zeitung. 38 p. Mainz, Gutenberg-Gesellsch., 1931. ISIS

Reviewed by W. KAPP, *DLZ*, 3, 817-20, 1932. The Wochenzeitung of JOHANN CAROLUS, Strassburg, 1609, and the weekly "Avisa," (probably, Augsburg), 1609, 1610, are the oldest known printed newspapers.

A. P.

XVIIth Century (second half)

B. — *Physical sciences and technology*

Fulton, J. F. ROBERT BOYLE and his influence on thought in the seventeenth century. *Isis*, 18, 77-102, 1932. ISIS

"ROBERT BOYLE (1627-1692) was one of the first in Science whose work was widely read by the lay public, and through this circumstance he exerted a far more important influence than is commonly recognized" "He touched nearly all branches of knowledge, however, and there is no division of modern Science, except possibly astronomy, which cannot trace phases of its origin in his writings. In addition to his well known contribution to the gas laws he was the first modern protagonist of the atomic structure of matter and he gave a clear statement of the kinetic theory of gases. He studied respiration, the chemical nature of blood and urine, magnets and electricity; but of even greater importance was the enunciation of a theory of combustion and respiration which recognized the dependence of the process on a substance extracted from the air."

Read, John. JOHN MAYOW's place in chemistry. *Nature*, 129, 157-58, 1932. ISIS

Review of T. S. PATTERSON's paper on JOHN MAYOW, *Isis*, 15, 47-96, 504-43, 1931.

C. — *Natural sciences*

(England). A map of XVII century England, with description, chronological tables, and a map of London, circa 1660. Scale: 16 miles to one inch. Southampton, Ordnance Survey, 1930. ISIS

Reviewed by L. E. W. O. FULLBROOK-LEGGATT, *Antiquity*, 5, 525-26, 1931.

Hoffmann, Johann Christian. Reise nach dem Kaplande, nach Mauritius und nach Java 1671-1676. Neu hrsg. nach der zu Cassel im Verlag von JOHANN FRIEDRICH HERTZOG im Jahre 1680 erschienenen Originalausgabe. 104+68 p. The Hague, NIJHOFF, 1931. ISIS

D. — *Medical sciences*

Dempster, James Herbert. JOHN LOCKE (1632-1704): physician and philosopher. *Ann. Med. Hist.*, 4, 12-60, 172-86, 1932. ISIS

A comprehensive and well organized biography. LOCKE's medical education and professional relations to T. SYDENHAM (1624-1689) are discussed, and a full account is given of LOCKE's famous treatment of the EARL OF SHAFTSBURY. A reprint is made of LOCKE's *Observationes Medicae*, a manuscript of 1667 in the British Museum, first published by E. T. WITHINGTON in *Janus*, in 1899. C. D. L.

Faucci, Ugo. Contributo alla storia della scabbia. 170 p., portr., facs. ***Rivista di Storia delle Scienze Mediche e Naturali***, 22, Maggio-Dicembre, 1931. ISIS

Apropos of " Osservazioni intorno a' Pellicelli del Corpo umano fatte dal Dott. GIO : COSIMO BONOMO e da lui con altre osservazioni scritte in una lettera all' Ill./mo Sig. FRANCESCO REDI. In Firenze 1687." The discovery of the parasitic nature of the itch must be attributed to BONOMO and CESTONI together. English summary.

Gille, M. Une thèse de médecine féministe au XVII[e] siècle. *Revue pratique de biologie appliquée* de CARRION, 24, 39-45, 1931. ISIS

Reviewed by PAUL DELAUNAY, *Bulletin de la Société française d'Histoire de la Médecine*, 25, 526, 1931.

Laignel-Lavastine ; Burill, Ives M. Les « cliniques » de Madame DE SÉVIGNÉ. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 131-38, 1932. ISIS

Major, Ralph H. RAYMOND VIEUSSENS (1641-1715) and his treatise on the heart. *Ann. Med. Hist.*, 4, 147-54, 1932. ISIS

A graduate of Montpellier, VIEUSSENS published his *Neurographia universalis* in 1684, *Novum vasorum corporis humani systema* in 1705, and *Traité nouveau de la structure et des causes du mouvement naturel du cœur* in 1715. While a speculative writer, he added to the anatomical knowledge of the central nervous system, and especially to the anatomy and pathology of the heart.
C. D. L.

E. — *Alia*

Carré, Jean-Marie. La première description du temple de Karnak dans la littérature française. *Chronique d'Egypte*, 7, 44-49, 1932. ISIS

Apropos of the *Relation du voyage du Sayd ou de la Thébayde fait en* 1668 *par les PP. Protais et Charles François d'Orléans, capucins missionnaires*, published in 1672, in vol. 2 of MELCHISÉDECH THEVENOT's *Relations de divers ouvrages curieux...* (4 vols. Paris, SÉBASTIEN MAGRE CRAMOISY, 1666-1696).
A. P.

Robinson, Howard. BAYLE, the sceptic. x+334 p. New York, Columbia University Press, 1931. ISIS

Reviewed by PRESERVED SMITH, *American Historical Review*, 37, 535-37, 1932.

Stimson, Dorothy. Ballad of Gresham Colledge. *Isis*, 18, 103-17, 1932. ISIS

Critical text, on the basis of three British Museum MSS. of a ballad on the Royal Society, composed probably in 1663 by JOSEPH GLANVILL, with abundant notes. G. S.

✓ **Stimson, Dorothy.** Dr. WILKINS and the Royal Society. *Journal of Modern History*, 3, 539-63, 1931. ISIS

Elaborate biography of JOHN WILKINS (1614-72), whose character is nicely summarized in the final paragraph: "Obviously WILKINS was not one of the great geniuses in science which England produced in the seventeenth century; but he had an eager curiosity and an openness of mind combined with a lively and courageous imagination that enabled him to fire others as well as himself with the possibilities he saw in the future of science. A lover of scientific pursuits all his days, on his deathbed he remarked he was 'ready for the Great Experiment.' While his books in scientific fields may perhaps not unfairly be classed among the curiosities of the history of thought, his most important contribution to science was the encouragement and help he gave to co-operative experimentation. The Royal Society stands today as an enduring testimony to the faith and the work of these notable 'amateurs' of the seventeenth century who themselves counted WILKINS as 'incomparable' and 'universally loved by all who know him.'" G. S.

XVIIIth Century (whole and first half)

B. — *Physical sciences and technology*

Meyer, E. P. C. On the early history of platinum. *Science*, 75, 438, 1932. ISIS

"I found references to platinum dated 1735. Some of these preserved documents refer to the shipment of rather large quantities (in one case 18 pounds) of alloyed metal which was called platina. In one document mention was made of a refined platinum, which had been treated with mercury prior to its shipment to Spain."

C. — *Natural sciences*

Desideri of Pistoia, Ippolito. An account of Tibet: the travels of IPPOLITO DESIDERI of Pistoia, S. J., 1712-1727. Edited by FILIPPO DE FILIPPI. With an introduction by C. WESSELS. XVIII+475 p. (Broadway Travellers.) London, Routledge, 1932. ISIS

Kremers, Edward. WILLIAM LEWIS. *Journal of the American Pharmaceutical Association*, 20, 1204-09, 1931. ISIS

WILLIAM LEWIS, 1714-1781.

D. — *Medical sciences*

Castiglioni, Arturo. ANTONIO MARIA VALSALVA. *Medical Life*, 39, 83-107, portr., ill., 1932. ISIS

Diepgen, Paul. GIOVANNI BATTISTA MORGAGNI und die Pathologie. Zum 25. Februar 1932. *Zeitschrift für ärztliche Fortbildung*, 29, 16 p., port., 1932. ISIS

" Keiner hat so wie MORGAGNI die Bedeutung des anatomischen Denkens für die Krankheitslehre in kritischer Kleinarbeit bewiesen und so fruchtbar auf die Generationen eingewirkt, die nach ihm kamen, denen er Lehrer und Wegweiser wurde. Für uns bleibt er das Vorbild pathologisch-anatomischer Methode und engster Zusammenarbeit von Klinik und Pathologie, von Theorie und Praxis."

Fanu, W. R. Le. More letters from B. S. ALBINUS to ROBERT NESBITT. *Janus*, 36, 1-26, 1932. ISIS

Klaauw, J. C. Van der. A letter of B. S. ALBINUS from Leiden to R. NESBITT in London. *Janus*, 35, 217-20, 1931. ISIS

E. — *Alia*

(Diderot). L'Encyclopédie et les Encyclopédistes. Exposition organisée par le Centre international de synthèse. 84 p., 14 ill. Paris, Bibliothèque Nationale, 1932. ISIS

Faÿ, Bernard. Learned societies in Europe and America in the eighteenth century. *American Historical Review*, 37, 255-66, 1932. ISIS

Richardson, Lyon Norman. A history of early American magazines, 1741-1789. XI+414 p. New York, NELSON, 1931. ISIS

Reviewed by BERTHA-MONICA STEARNS, *American Historical Review*, 37, 807-08, 1932.

Shorr, Philip. Science and superstition in the eighteenth century. A study of the treatment of science in two encyclopedias of 1725-1750. CHAMBERS' Cyclopedia : London (1728) ; ZEDLER's Universal Lexicon : Leipzig (1732-1750). 82 p. New York, Columbia University Press, 1932. ($ 1.50). ISIS

Our readers may remember the startling paper published by LYNN

THORNDIKE in 1924 : *L'Encyclopédie* and the History of Science (*Isis*, 6, 361-86). THORNDIKE showed that the *Encyclopédie* in spite of its rationalism was still far more " medieval " than one would have imagined. A similar enquiry has been made by SHORR with regard to two encyclopaedias of the first half of the eighteenth century, with similar results. EPHRAIM CHAMBERS was a scientist in a small way and an avowed freethinker; he attached much importance to mechanical inventions. His *Cyclopedia* was very popular, witness the publication of five editions between 1728 and 1743 and of later ones. ZEDLER's *Universal Lexikon* in 64 volumes was the first encyclopaedia for which many collaborators were enlisted, but the point of view was theological, and the editors were not scientists. Under those conditions it is not surprising that both works were much inferior from the point of view of rational knowledge to the *Encyclopédie*.

The author shows that the writers of these encyclopaedic treatises did not know the history of science but they may perhaps be forgiven, considering that his own knowledge of it is very superficial. For example, he speaks on two occasions of AL-KHWĀRIZMĪ and MĀSHĀLLĀH as if they were two of the greatest astronomers of the Middle Ages which is ludicrous. Many other statements reveal the uncertainty and immaturity of his knowledge. On p. 13, the author seems to put DIDEROT and D'ALEMBERT on the same footing as men of science. Now DIDEROT was simply a man of letters, with deep scientific interests it is true, while d'ALEMBERT is one of the greatest scientific geniuses of all times.

The main value of SHORR's work, as of THORNDIKE's paper, is that they help us to realize the limitations of eighteenth century rationalism and hence may lead men of science to a more generous and less bigoted appreciation of mediaeval thought. There are many other witnesses of eighteenth century mediaevalism and superstition, e.g., Rosicrucianism, and toward the end of the century, Martinism. G. S.

XVIIIth Century (second half)

B. — *Physical sciences and technology*

(Lavoisier). An unpublished letter of LAVOISIER. With a note by E. J. HOLMYARD. *Nature*, 130, 97, 1932. ISIS

Lemay, P. BERTHOLLET et l'emploi du chlore pour le blanchiment des toiles. *R. d'hist. de la pharmacie*, n° 78, 79-86, portr., 2 pl., 1932. ISIS

" Description de l'art du blanchiment par l'acide muriatique oxygéné " (1795).

Meldrum, Andrew N. LAVOISIER's three notes on combustion, 1772. *Archeion*, 14, 15-30, 1 facs., 1932. ISIS

Notes du 10 septembre 1772 « Expériences sur le phosphore», du 20 octobre « Mémoire sur l'acide du phosphore... », du 1er novembre, sur la combustion du soufre et l'augmentation du poids des « chaux métalliques». Interprétation

de SPETER sur LAVOISIER, MITOUARD et PRIESTLEY. L'évolution des idées de LAVOISIER sur la combustion en cette année 1772. L. G.

Mieli, Aldo. Introduction à l'étude du rôle de LAVOISIER dans l'histoire de la chimie. *Archeion*, 14, 31-50, 1932. ISIS

Communication faite à la section d'histoire des sciences du Centre international de synthèse le 18 novembre 1931.

Partington, J. R. GUYTON DE MORVEAU (1737-1816). *Isis*, 18, 191, 1932. ISIS

Footnote to *Isis*, 11, 196, 1928. G. S.

C. — *Natural sciences*

Martin, Lawrence. The GEORGE WASHINGTON atlas : a collection of eighty-five maps, including twenty-eight made by GEORGE WASHINGTON, seven used and annotated by him, eight made at his direction or for his use, or otherwise associated with him, and forty-two new maps concerning his activities in peace and war and his place in history. Washintgon, D.C., United States George Washington Bicentennial Commission, 1932. ISIS

Reviewed in *Geographical Review*, 22, 502, 1932.

Viénot, John. GEORGES CUVIER, 1769-1832. 247 p., 14 illus. Paris, FISCHBACHER, 1932. ISIS

Tableau de la vie de CUVIER, non de son œuvre, mais tous les détails de la vie d'un homme aussi grand et aussi bon sont précieux. GOETHE l'appella « le Napoléon de l'intelligence », — cela peut se dire mais n'est pas de bon goût comme sous-titre. L'auteur, protestant comme CUVIER, s'est occupé de lui depuis longtemps, comme le prouvent les lettres inédites de CUVIER à G. L. DUVERNOY qu'il publia dans la *Revue chrétienne* en 1905. Le livre contient beaucoup de détails intéressants sur la vie privée et publique de CUVIER mais n'est encore qu'un travail d'approche. CUVIER mérite plus et mieux. G. S.

D. — *Medical sciences*

Bishop, W. J. THOMAS DIMSDALE, M.D., F.R.S. (1712-1800) and the inoculation of CATHERINE THE GREAT of Russia. *Ann. Med. Hist.*, 4, 321-38, 7 figs., frontisp. 1932. ISIS

Duncan, Louis C. Medical men in the American Revolution (1775-1783). 414 p., 53 illus. Carlisle Barracks, Pennsylvania, Medical Field Service School, 1931. ISIS

A very comprehensive, well-written, and skillfully organized volume. It

is exceptionally well illustrated with contemporaneous documentary material.
C. D. L.

Favaro, Giuseppe. ANTONIO SCARPA e i CALDANI. *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti*, 91, 23-37, 1931. ISIS

Favaro, Giuseppe. ANTONIO SCARPA e GIROLAMO TIRABOSCHI a proposito di latino. *Atti e Memorie della R. Accademia di Scienze, Lettere ed Arti in Modena*, Sezione Lettere, 3, 12 p., 1931. ISIS

Favaro, Giuseppe. ANTONIO SCARPA e l'Università di Padova. *Atti del Reale Istituto Veneto di Scienze, Lettere ed Arti*, 91, 22 p., 1931-1932. ISIS

Favaro, Giuseppe. GIAMBATTISTA MORGAGNI e ANTONIO SCARPA. Numero unico in onore di G. B. MORGAGNI, 4 p., Siena, 1931. ISIS

Favaro, Giuseppe. "Publica doctoratus privilegia" a MORGAGNO praeside subscripta. Numero unico in onore di G. B. MORGAGNI, 1 p., 2 fig., Siena, 1931. ISIS

Meyerhof, Max. A short history of ophthalmia during the Egyptian campaigns of 1798-1807. Reprinted from *The British Journal of Ophthalmology*, 129-52, 1932. ISIS

Conclusions: "1. The ophthalmias affecting the French, Turkish and British armies in Egypt during the campaigns from 1798 to 1802 and in 1807 were—as far as the rather vague descriptions left by military surgeons allow them to be identified—the same as those which are still prevalent in Egypt. That is, a combination of Koch-Weeks', gonorrhoeal and post-gonorrhoeal conjunctivitis with trachoma. The high percentage of blindness was due to gonococcic infections (which are transmitted, in hot climates, by extragenital means). 2. The contagious nature of the disease, not admitted by French surgeons, was discovered by several young surgeons of the British Army and Navy (EDMONDSTON, POWER, BRIGGES, REID and DEWAR) and established by judicious observations. 3. The improved conditions which have prevailed in the British Army of Occupation in Egypt with regard to ophthalmia, throughout a stay of over half a century, are due to the personal cleanliness of the troops and the high standard of their education in hygiene."

Peachey, George C. WILLIAM ANDRE, anatomist. *Ann. Med. Hist.*, 4, 61-63, 1932. ISIS

Petersen, William F. STRUENSEE. *Ann. Med. Hist.*, 4, 364-476, 6 figs., 1932. ISIS

Physicians seldom have been good statesmen, except when they have been physicians in name only. JOHANN FRIEDRICH STRUENSEE (1737-1772), the son of a pietistic divine, failed to gain professional recognition by his

many journalistic ventures but became attached to the court of the insane CHRISTIAN VII of Denmark. His influence with Queen CAROLINE MATHILDA (sister of GEORGE III of England) was so great that he began an extraordinary series of state reforms, among which were freedom of the press, the first in Europe. But his scandalous relations with the Queen were exposed and he was beheaded and she was saved for exile only by the English fleet.

C. D. L.

Tiberius von Györy. Die ersten Jahre der medizinischen Fakultät in Nagyszombat (Tyrnau). *Sudhoffs Archiv für Geschichte der Medizin*, 25, 214-48, 1932. ISIS

Trénel, Dr. BICHAT, voleur de cadavres. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 97-106, 1932. ISIS

E. — *Alia*

Blanchet, Adrien. Le troisième recueil de BEAUMESNIL sur des antiquités de Périgueux (1784). *Journal des Savants*, 171-75, 1932. ISIS

Cole, F. J. GOETHE as biologist. *Nature*, 129, 423-25, 1932. ISIS

(Goethe). GOETHE's reflections on nature. *Nature*, 129, 425-26, 1932. ISIS

Translation of GOETHE's reflections on nature by T. H. HUXLEY, which was published as an introductory article to the first number of *Nature*, dated Nov. 4, 1869.

Photiadès, Constantin. Les vies du comte DE CAGLIOSTRO. 443 p. Paris, GRASSET, 1932. ISIS

Spiegel, Käthe. Kulturgeschichtliche Grundlagen der amerikanischen Revolution. x+214 p. (Beiheft 21 d. *Histor. Zeitschr.*) München, OLDENBOURG, 1931. ISIS

Reviewed by OTTO Graf zu STOLBERG-WERNIGERODE, *DLZ*, 3, 1424-30, 1932.

XIXth Century (whole and first half)

A. — *Mathematics*

Bolzano, Bernard (1781-1848). Schriften herausgegeben von der Königlichen Böhmischen Gesellschaft der Wissenschaften, Bd. 3. Von dem besten Staate ; hrsg. und mit einführenden Bemerkungen

versehen von ARNOLD KOWALEWSKI. XXXIV+134 p. Prag, 1932. ISIS

The publication of BOLZANO's complete works by the Bohemian Academy was first announced in *Isis* when the first part of it appeared (1930; *Isis*, 15, 353-55). The present installment reproduces a work of his which was hitherto unknown except in a fragmentary way. It is now completely published upon the basis of two MSS. kept in the Národní Museum in Prague. This treatise on the "Best government," or rather the guiding principles of it were conceived by BOLZANO before he was thirty years of age and they are consistent in the deepest sense with his other writings. For example, in his *Lehrbuch der Religionswissenschaft* (III, 2) he developed the categorical imperative "Handle immer so, wie es das allgemeine Beste oder das Wohl des Ganzen erfordert." Similarly the purpose of the present treatise was to determine the general conditions of government which would advance the public good in the most perfect manner. A further analysis of it would be out of place in *Isis*, but we are glad to mention the existence of a book throwing new light on BOLZANO's complex genius and deep humanity. G. S.

Bolzano, Bernard. Zahlentheorie. Hrsg. und mit Anmerkungen versehen von KAREL RYCHLÍK. 579 p. (BERNARD BOLZANO's Schriften hrsg. von der Königlichen Böhmischen Gesellschaft der Wissenschaften, Bd. 2.) Prag, 1931. ISIS

"Der vorliegende Band enthält als zweiter Band mathematischen Inhalts die bisher noch nicht im Druck erschienene Zahlentheorie von BOLZANO. Die Herausgabe erfolgt nach einem Manuskript, welches in der Wiener National- (früher Hof-) Bibliothek aufbewahrt wird. Die Zahlentheorie bildet, ebenso wie die 'Functionenlehre,' einen Teil eines grösseren Werkes über Mathematik, der 'Grössenlehre.' Der Titel Zahlentheorie wurde vom Herausgeber gewählt. Von BOLZANO selbst wird dieser Teil 'Verhältniss der Theilbarkeit unter den Zahlen' betitelt."

B. — *Physical sciences and technology*

Bessmertny, Bertha. HERMANN KOPP als Chemiker. *Archeion*, 14, 62-68, 1932. ISIS

Davy, M. J. B. HENSON and STRINGFELLOW, their work in aeronautics: the history of a stage in the development of mechanical flight, 1840-1868. 115 p., 25 pl. (Board of education: Science Museum). London, H. M. Stationery Office, 1931. ISIS

Reviewed in *Nature*, 129, 456, 1932.

(Faraday). Metallurgical researches of MICHAEL FARADAY. By F. C. T. *Nature*, 129, 45-47, 1932. ISIS

Ferguson, Allan. YOUNG, CHAMPOLLION, and hieroglyphics. *Nature*, 129, 638-40, 1932. ISIS

"It is a matter of fact that the first successful steps towards the solution of the problem of hieroglyphics were due to the genius of THOMAS YOUNG; and it is demonstrable that CHAMPOLLION had not realised the correct mode of attack on the problem until YOUNG's discoveries pointed out the way."

Genty, M. Le médecin CHARLES SAURIA, inventeur des allumettes chimiques. *Progrès médical*, n° 23, 1038-43, 1931. ISIS

CHARLES SAURIA, 1812-1895. Reviewed in *Bulletin de la Société Française d'Histoire de la Médecine*, 26, 72, 1932.

Guillemin, Ernst Adolph. Early developments in electromagnetic theory. With two unpublished letters by ANDRÉ MARIE AMPÈRE. *Isis*, 18, 118-26, facs., 1932. ISIS

The two letters were written in 1821 and 1822 to SPEYERT VAN DER EYK, professor in Leiden. Complete text, facsimile of a part, introduction, and notes. G. S.

Jackson, Dugald C. Our debt to FARADAY's epoch. *Science*, 75, 230-32, 1932. ISIS

Kennelly, Arthur E. The work of JOSEPH HENRY in relation to applied science and engineering. *Science*, 76, 1-7, 1932. ISIS

Larmor, J. Historical note on HAMILTONian rays and dynamical action. *Atti del Congresso internazionale dei matematici*, Bologna 3-10 settembre, 1928, 5, 79-82, 1931. ISIS

(Liebig, Justus von). Letter from LIEBIG to FARADAY, dated Giessen, Dec. 19, 1844, edited by ALICE M. BUCKTON. *The Times*, London, p. 11, August 31, 1932. ISIS

Lippmann, Edmund O. von. HERMANN KOPP als Historiker. *Archeion*, 14, 1-5, 1932. ISIS

"Die Geschichte der Chemie" (1843-47, 4 Bde., Neudruck der Originalausgabe, 1931; "Beiträge zur Geschichte der Chemie" 1869; Entwicklung der Chemie in der neueren Zeit" 1871; "Die Alchemie in älterer und neuerer Zeit" 1886.

Lippmann, Edmund O. von. Zur Frage nach dem Alter des Ausdruckes "Organische Chemie." *Chemiker-Zeitung*, 51, 501, 1932.

NOVALIS (VON HARDENBERG, 1772-1801) used the expression "organische Chymie" at least seven years before BERZELIUS (1808). A. P.

Metzger, Hélène. EUGÈNE CHEVREUL historien de la chimie. *Archeion*, 14, 6-12, 1932. ISIS

De l'œuvre historique importante, mais généralement inconnue d'EUGÈNE CHEVREUL (1786-1889), l'auteur examine le « Résumé d'une histoire de la matière depuis les philosophes grecs jusqu'à Lavoisier inclusivement » (1878). L. G.

Mittasch, Alwin ; Theis, E. Von DAVY und DÖBEREINER bis DEACON : ein halbes Jahrhundert Grenzflächenkatalyse. 278 p., 16 pl. Berlin, Verlag Chemie, 1932. ISIS

C. — *Natural sciences*

Barlow, N. The voyage of the *Beagle*. *Nature*, 129, 439, 1932. ISIS

Bing, Franklin C. A forgotten contribution to nutrition by MAGENDIE. *Science*, 74, 456, 1931. ISIS

Darmstaedter, Ernst. ACHIM VON ARNIM und die Naturwissenschaft. *Euphorion*, 32, 454-76, 1931. ISIS

Darmstaedter, Ernst. Erinnerung an DARWIN. Antritt seiner Weltreise am 27. Dezember 1831. *Münchener medizinische Wochenschrift*, 50, 2126-29, 1931. ISIS

Dehérain, Henri. A propos du centenaire de GEORGES CUVIER, membre de l'Académie des Inscriptions et Belles Lettres, *Journal des Savants*, 222-28, 1932. ISIS

Hildebrandt, Kurt. GOETHE und DARWIN. *Arch. f. Geschichte der Philosophie*, 41, 57-79, 1932. ISIS

Karpinski, Louis Charles. Bibliography of the printed maps of Michigan, 1804-1880, with a series of over one hundred reproductions of maps constituting an historical atlas of the Great Lakes and Michigan. 539 p. Lansing, Michigan Historical Commission, 1931. ISIS

Reviewed by M. M. QUAIFE, *American Historical Review*, 37, 575-76, 1932.

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Contains the following papers: ROBERT BROWN, botanicorum facile princeps,

by J. RAMSBOTTOM; ROBERT BROWN's zoological collections made during the voyage of the 'Investigator,' by N. B. KINNEAR; ROBERT BROWN as an official of the Linnean Society, by S. SAVAGE; ROBERT BROWN's discovery of the nucleus in relation to the history of the cell theory, by J. STEPHENSON; Remarks on an exhibit of living mites, *glycyphagus domesticus* (DE GEER), by SUSAN FINNEGAN.

Stevens, Neil E. The mycological work of HENRY W. RAVENEL. *Isis*, 18, 133-49, 1 pl., 1932. ISIS

Brief biography, portrait, and account of the scientific work of HENRY W. RAVENEL, a great botanist of South Carolina (1814-87). G. S.

D. — *Medical sciences*

Ackerknecht, Erwin H. Beiträge zur Geschichte der Medizinalreform von 1848. *Sudhoffs Archiv für Geschichte der Medizin*, 25, 113-83, 1932. ISIS

Delaunay, Paul. Un agrégé de la restauration : le Docteur PAVET DE COURTEILLE. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 50-69, 1932. ISIS

CHARLES PAVET DE COURTEILLE, 1788-1868.

Favaro, Giuseppe. L'insegnamento dell' anatomia in Modena un secolo fa. *Rassegna per la storia della Università di Modena e della cultura superiore modenese*, 42 p., 1931. ISIS

Hérissay, Jacques. L'exercice illégal de la médecine, dans l'Eure, sous le consulat. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 84-94, 1932. ISIS

Lemay, Dr. Contribution à la biographie d'ORFILA. *Bulletin de la Société française d'Histoire de la Médecine*, 25, 516-22, 1931. ISIS

Mason, J. M. Early medical education in the far South. *Ann. Med. Hist.*, 4, 64-79, 10 fig., 1932. ISIS

The Medical College of Louisiana (New Orleans) was organized in 1834 by THOMAS HUNT (1808-1867), WARREN STONE (1808-1872) and J. H. HARRISON (1808-1849), all of whom came to New Orleans in 1832 when the city was devastated by yellow fever and cholera. In 1884, the College became part of Tulane University of Louisiana which was established by PAUL TULANE (1801-1887) of New Jersey. It was closely affiliated, until recent political troubles, with the Charity Hospital (founded as St. John's in 1737, and rebuilt in 1786 by Don ANDRES ALMONASTER Y ROJAS). STONE established a tradition in the school for brillant vascular surgery. One of the early pro-

fessors in the school was J. L. RIDDELL, inventor of the binocular microscope.
C. D. L.

Rosenthal, Theodore. DAVID GRÜBY (1810-1898). *Ann. Med. Hist.*, 4, 339-46, portr., 1932. ISIS

A Hungarian by birth, GRÜBY became one of the great Parisian medical teachers. His contributions were chiefly in parasitic diseases, discovering the real nature of ringworm, and the causes of thrush and favus.
C. D. L.

Roth, George B. The " Original MORTON Inhaler " for ether. *Ann. Med. Hist.*, 4, 390-97, 5 figs., 1932. ISIS

A tinned metal device submitted by A. A. GOULD and W. T. G. MORTON to the United States Patent Office, now in the Smithsonian Institution. On this device patent No. 5365, November 13, 1847, was issued. Patent No. 4848, issued November 12, 1846, describes the method for producing surgical anesthesia by means of ether. The Smithsonian Institution (Wiksell exhibit), the Harvard Medical School Museum, and the Massachusetts General Hospital (Ether room) possess identical glass devices, claimed to have been the original inhalers used by MORTON in the first public demonstration of ether anesthesia at the Massachusetts General Hospital, October 16, 1846.
C. D. L.

Schäfer, Anton. Leben und Wirken des Arztes FRANZ PRUNER-Bey. *Janus*, 35, 249-77, 297-311, 335-43, 360-75, 1 portr., 1931 ; 36, 59-70, 114-27, 1932. ISIS

FRANZ PRUNER (1808-1882). Médecin et ethnologiste allemand, FRANZ PRUNER fut professeur d'anatomie en Egypte ; il a publié de nombreux travaux sur l'anthropologie, l'ethnographie, les épidémies. Une bibliographie des œuvres de PRUNER complète le mémoire d'ANTON SCHÄFER. L. S.

E. — *Alia*

Berthelot, René. Science et philosophie chez GOETHE. 190 p. (*Bibl. de philosophie contemporaine*), Paris, ALCAN, 1932. ISIS

Réimpression de deux études publiées dans la *Revue de métaphysique et de morale :* GOETHE et LAMARCK (*Isis*, 14, 499), GOETHE et HEGEL.

L'auteur les fait suivre d'un appendice intitulé : « GOETHE et la vie spirituelle », reproduit du *Bulletin de l'Union pour la vérité* (avril-mai 1931).
L. G.

Bushnell, David I., jr. SETH EASTMAN : the master painter of the North American Indian. Washington, *Smithsonian Miscellaneous Collections*, vol. 87, 18 p., 15 pl., 1932. ISIS

(British Association for the Advancement of Science). The

British Association : some early documents. *Nature*, 129, 494-95, 1932. ISIS

Devolvé, Jean. Réflexions sur la pensée comtienne. VIII+318 p., (*Biblioth. de philosophie contemporaine*), Paris, ALCAN, 1932. ISIS

« COMTE s'est cru l'Aristote d'un temps nouveau, édifiant le dogme rationnel, dont au cours des temps antérieurs des efforts dispersés et successifs auraient préparé les matériaux; il a prétendu concevoir ou élaborer la vraie science, la vraie philosophie et les cadres définitifs de l'action humaine ». « Sa figure grandit singulièrement, sitôt qu'on veut bien voir en lui un initiateur, et non suivre ou juger un réalisateur. Initiateur pour avoir porté le regard d'un génie authentiquement philosophique droit sur deux formes nouvellement dominantes en son temps de la préoccupation intellectuelle : l'une produite par le développement progressivement accéléré de la connaissance objective méthodique, et l'autre par une accélération symétrique des changements et complications de l'ordre politique, économique, moral et religieux... Il a été capable d'embrasser par son génie propre dans leur réelle extension les problèmes essentiels de la philosophie, et, sans guère profiter de l'appui de la tradition philosophique, d'en chercher des solutions neuves à partir des données fournies par les préoccupations scientifiques et sociales de son temps ». Le premier chapitre, intitulé : l'histoire mentale d'AUGUSTE COMTE, avait paru au *Journal de psychologie*, 28, 749-68, 1931. L. G.

Dickinson, H. W. J. O. HALLIWELL and the Historical Society of Science (London, 1841). *Isis*, 18, 127-32, 1932. ISIS

Account of this short-lived Society and of its publications, and brief biography of its founder, JAMES ORCHARD HALLIWELL (1820-1889). G. S.

Lippmann, Edmund O. von. Zum hundertjährigen Todestage GOETHES. *Die Deutsche Zuckerindustrie*, 32, 247-48, 1932. ISIS

Stearns, Bertha-Monica. Reform periodicals and female reformers 1830-1860. *American Historical Review*, 37, 678-99, 1932. ISIS

XIXth Century (second half)

B. — *Physical sciences and technology*

Broglie, M. de. The Right Hon. Lord RUTHERFORD of Nelson, O. M., F. R. S. *Nature*, 129, 665-69, 1932. ISIS

Edgar, Charles L. An appreciation of Mr. EDISON based on personal acquaintance. *Science*, 75, 59-65, 1932. ISIS

(Hastings, C. S.). CHARLES SHELDON HASTINGS. *Science*, 75, 428-30, 1932. ISIS

C. S. HASTINGS, 1848-1932. Expert in optics.

Jewett, F. B. EDISON's contributions to science and industry. *Science*, 75, 65-68, 1932. ISIS

Millikan, Robert Andrews. EDISON as a scientist. *Science*, 75, 68-70, 1932. ISIS

(Perkin, William Henry). Life and work of WILLIAM HENRY PERKIN. *Journal of the British Chemical Society*, 138 p. (special number). ISIS

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Walker, Gilbert T. HELMHOLTZ or KELVIN cloud waves. *Nature*, 129, 205, 1932. ISIS

C. — *Natural sciences*

Iltis, Hugo. Life of MENDEL. Translated by EDEN and CEDAR PAUL. 336 p., 12 pl. London, ALLEN and UNWIN, 1932. ISIS

Tulasne, Louis René ; Tulasne, C. Selecta fungorum carpologia of the brothers L. R. and C. TULASNE. Translated into English by W. B. GROVE. Edited by A. H. REGINALD BULLER and C. L. SHEAR. 3 vols. Vol. 1. XXX+XXV+247 p., 5 pl. Vol. 2. XXIII+302 p., 34 pl. Vol. 3. XVIII+206 p., 22 pl. Oxford, Clarendon Press, 1931. ISIS

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D. — *Medical sciences*

Diepgen, Paul. VIRCHOW und die Romantik. *Deutsche Medizinische Wochenschrift*, No. 32, 7 p., 1932. ISIS

Haberling, Wilhelm. JOHAN GEORG MEZGER of Amsterdam. Translated by EMILIE RECHT. *Medical Life*, 39, 191-207, portr., illus., 1932. ISIS

J. G. MEZGER, 1838-1909.

Hervé, Georges. Une notice biographique peu connue sur EMILE KÜSS par BEAUNIS, suivie de quelques souvenirs inédits. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 107-30, 1932. ISIS

Notes on EMILE KÜSS (1815-1871) by H. BEAUNIS, by D. GOLDSCHMIDT (1832-1926), and by LÉON OBERLIN (1841-1929).

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6 pl. (*Grosse Männer* : *Studien zur Biologie des Genies*, hrsg. von WILHELM OSTWALD, Bd. 12). Leipzig, Akademische Verlagsgesellschaft, 1932. ISIS

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McKenzie, Dan. ALFRED HIGGINSON (1808-1884) and his syringe : with a side-glance at the clyster. *Proc. Roy. Soc. Med.*, 25, 633-38, 1932. ISIS

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Robinson, Victor. ROBERT KOCH (1843-1910). *Medical Life*, 39, 127-72, illus., 1932. ISIS

"This essay originally appeared in *Medical Life* (September 1924) and is chapter XVII of *Pathfinders in Medicine* (1929). Republished, with a new illustration, in commemoration of the fiftieth anniversary of ROBERT KOCH's discovery of the tubercle bacillus."

E. — *Alia*

Devaux, Philippe. LOTZE et son influence sur la philosophie anglo-saxonne. Contribution à l'étude historique et critique de la notion de valeur. *Archives de la Société belge de philosophie*, 3, 1-48, 1932. ISIS

RUDOLF HERMANN LOTZE (Bautzen, 1817 — Berlin, 1881).

XXth Century

A. — *Mathematics*

Chevalley, Claude; Dandieu, Arnaud. Logique hilbertienne et psychologie. *R. philosophique*, 57, 99-111, 1932. ISIS

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"GRONWALL's work covered a wide variety of subjects. He wrote on analytic functions, infinite series, nomography, the analytic theory of numbers, differential geometry, integral equations, ballistics, elasticity, electrical theory and relativity."

Lichtenstein, L. La philosophie des mathématiques selon EMILE MEYERSON. *R. philosophique*, 57, 169-206, 1932. ISIS

(Wieleitner, Heinrich). *Bayr. Blätter f. d. Gymnasialschulwesen*, 68, 90-94, portr., 1932. ISIS

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B. — *Physical sciences and technology*

(Ault, J. P., 1881-1929). In appreciation of the work of JAMES PERCY AULT of the Department of terrestrial magnetism. By FRED E. WRIGHT. *Terrestrial Magnetism and Atmospheric Electricity*, 34, 279, 1929. ISIS

(Bauer, L. A.) LOUIS AGRICOLA BAUER (1865-1932). By J. A. FLEMING. *Science*, 75, 452-54, 1932. ISIS

Bohr, Niels. Chemistry and the quantum theory of atomic constitution (Faraday lecture, May 8th, 1930). *Journal of the Chemical Society*, 349-84, 1932. ISIS

Article de la plus haute importance. L'illustre physicien y esquisse l'histoire du développement logique des idées fondamentales relatives à la structure des atomes. J. P.

Compton, Karl T. EDISON's laboratory in war time. *Science*, 75, 70-71, 1932. ISIS

(Eastman, George). GEORGE EASTMAN. By KARL T. COMPTON. *Science*, 75, 402-05, 1932. ISIS

Ferguson, Allan. Prof. PLANCK and the principle of causality in physics. *Nature*, 130, 45-48, 1932. ISIS

Seventeenth Guthrie Lecture before the Physical Society, delivered by MAX PLANCK on June 17.

Fisk, H. W. In tribute to the memory of JAMES PERCY AULT. *Terrestrial Magnetism and Atmospheric Electricity*, 34, 279-80, 1929. ISIS

Harradon, H. D. JAMES PERCY AULT, 1881-1929. *Terrestrial Magnetism and Atmospheric Electricity*, 34, 273-78, port., 1929. ISIS

Kolrausch, K. W. F. Ramaneffekt und Chemie. *Scientia*, 51, 335-47, 1932. ISIS

Langevin, P. L'œuvre d'EINSTEIN et l'astronomie. *L'enseignement scientifique*, 5, 193-202, 225-29, 1932. ISIS

C. — *Natural sciences*

Andrews, Roy Chapman. J. MCKENZIE YOUNG. A gallant comrade in the field of exploration—a resourceful worker—a steadfast friend. *Natural History*, 32, 321-26, illus., 1932. ISIS

Merriam, C. Hart. ROOSEVELT, the naturalist. *Science*, 75, 181-83, 1932. ISIS

Ranzi, Silvio. Esistono i gradienti fisiologici di CHILD? *Scientia*, 51, 348-56, 1932. ISIS

D. — *Medical sciences*

Burr, Charles W. Memoir of Dr. FRANCIS X. DERCUM. *Medical Life*, 39, 221-28, portr., 1932. ISIS

F. X. DERCUM, 1856-1931.

Eckstein, Gustav. NOGUCHI. XII+419 p., 8 pl. New York, HARPER, 1931. ISIS

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Lusk, Graham. Contributions to the science of nutrition. A tribute to the life and work of MAX RUBNER. *Science*, 76, 129-35, 1932. ISIS

MAX RUBNER, 1854-1932.

(Kitasato, S.). SHIBASABURO KITASATO. By MIKINOSUKE MIYAJIMA. *Science*, 74, 124-25, 1931. ISIS

SHIBASABURO KITASATO, 1856-1931.

(Schaudinn, F.) SCHAUDINN, a biographical appreciation. By JOHN H. STOKES. *Science*, 74, 502-06, 1931. ISIS

FRITZ SCHAUDINN, 1871-1906.

E. — *Alia*

Bierens de Haan, J. A. La psychologie animale en Hollande de 1928 à 1930. *Recherches philosophiques*, 1, 334-44, 1932. ISIS

Norman, Louis E. Van. Ten years of the new Turkey—an economic retrospect. *The Open Court*, 46, 320-30, figs., 1932. ISIS

Renauld, Jeanne F. L'œuvre de GUSTAVE BELOT. *R. de métaphysique et de morale*, 39, 237-52, 1932. ISIS

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(Rose, W.). WICKLIFFE ROSE (1862-1931). By SIMON FLEXNER. *Science*, 75, 504-06, 1932. ISIS

Read at the meeting of the National Academy of Sciences, Washington, D.C., April 26, 1932, at the posthumous award on WICKLIFFE ROSE of the Marcellus Hartley medal for eminence in the application of science to the public welfare.

Verlaine, L. La psychologie animale en Belgique. *Recherches philosophiques*, 1, 322-33, 1932. ISIS

Weber, Louis. Une philosophie de l'invention. M. EDOUARD LEROY. *R. de métaphysique et de morale*, 39, 59-86, 253-92, 1932. ISIS

A propos des derniers ouvrages d'EDOUARD LEROY : La pensée intuitive (*Isis*, 18, 393); L'exigence idéaliste et le fait de l'évolution (*Isis*, 13, 243); Les origines humaines et l'évolution de l'intelligence (*Isis*, 13, 243-44).

L. G.

PART II

HISTORICAL CLASSIFICATION

Including only the items which could not be included in Part I—the fundamental (centurial) classification. Hence a student of Muslim science, for example, should not peruse simply the notes collected below under the heading "Islam," he should examine as well those included above under the headings VIIth century, VIIIth century, etc.

I. ANTIQUITY

2. — EGYPT

Capart, Jean; Werbrouck, Marcelle. Memphis à l'ombre des pyramides. XVII+415 p., 391 pl., fig. (Fondation Egyptol. Reine Elisabeth). Brussels, VROMANT, 1930. ISIS

Reviewed by A. SCHARFF, *DLZ*, 3, 938-40, 1932.

Clarke, Somers; Engelbach, R. Ancient Egyptian masonry. The building craft. XVI+242 p., front., illus., pl., map. Oxford, University Press, 1930. ISIS

Closson, Ernest. Hautbois égyptiens antiques au Musée du Conservatoire Royal de Bruxelles. *Chronique d'Egypte*, 7, 50-52, 1932. ISIS

Erman, Adolf; Grapow, Hermann. Wörterbuch der ägyptischen Sprache. Bd. 1-5. Leipzig, HINRICHS, 1926-1931. ISIS

Reviewed by H. O. LANGE, *DLZ*, 3, 404-06, 1932.

Giesecke, Walther. Das Ptolemäergeld. Eine Entwicklungsgeschichte des ägyptischen Münzwesens unter Berücksichtigung der Verhältnisse von Kyrene. V+98 p., 4 pl. Leipzig, TEUBNER, 1930. ISIS

Reviewed by F. HEICHELHEIM, *DLZ*, 3, 942-45, 1932.

Grohmann, Adolf. Griechische und lateinische Verwaltungstermini im arabischen Aegypten. *Chronique d'Egypte*, 7, 275-84, 1932. ISIS

Kropp, M. (O. P.) Ausgewählte Koptische Zaubertexte. Geleitwort von JEAN CAPART. Vorrede von W. E. CRUM. Vol. 1 : Textpublikation. XVII+123 p., 7 facsim., 4 pl.; vol. 2 : Übersetzungen und Anmerkungen, XV+285 p.; vol. 3, Einleitung in koptische Zauber-

texte, XII+252 p., 8 pl. Bruxelles, Fondation égyptologique Reine Elisabeth, 1931. ISIS

Ces trois volumes ne nous concernent qu'indirectement, mais il est bon de les signaler parce que les historiens de la science ne doivent jamais oublier les alentours magiques de leur domaine. On pourrait dire que la science s'est développée — et dans une certaine mesure se développe encore — dans une atmosphère magique. Mais au lieu de concevoir, comme le fait THORNDIKE, une sorte de collaboration entre la magie et la science, je conçois plutôt une rivalité mortelle. En tous cas l'atmosphère magique nous entoure et nous pénètre, et cela est d'autant plus vrai en général à mesure que l'on s'enfonce dans le passé. Quant à la magie copte représentée par ces textes, les extraits suivants de la préface de M. JEAN CAPART aideront à la définir (p. viii) :

« C'est l'esprit de l'ancienne magie qui s'affirme encore sous le manteau du christianisme. On continue à pratiquer les ' Lettres au mort '; on emploie les poupées de cire; le magicien possède les grands noms des puissances qu'il invoque; il croit à la valeur des mots en langue étrangère. Le magicien recourt aux menaces à Dieu, si typiques dans la vieille magie : il va jusqu'à promettre d'aller chercher le diable en enfer et de le reconnaître pour Dieu. Il fait un pas de plus : il s'identifie à Jésus, identifie sa mère à Marie. On sent que ses lèvres disent : Jésus et Marie, mais que sa pensée est encore fixée sur Horus et Isis. Lorsque le magicien annonce que ' le savant Hénoch ne mettra plus son roseau dans son encre, jusqu'à ce que...,' on devine qu'il s'agit de Thot, qui n'a guère cessé d'être le ' scribe du jugement divin.' Je suis persuadé que l'étude de la magie copte amènera les égyptologues à mieux comprendre certains textes, certains usages. Je leur recommande le paragraphe 191, où ils verront l'emploi de l'*ousia* d'un animal. Le magicien tue un animal sacré dans l'espoir de se servir à son bénéfice, de la relation *sympathique* qui existe entre cet animal et le dieu ou le démon sur lequel il s'agit d'exercer une emprise. Je me demande si un tel rite ne peut expliquer la consécration au bénéfice de tel ou tel individu de petits bronzes de Basse Époque servant de cercueil à des animaux sacrés ». G. S.

Lint, J. G. de. La chirurgie dans l'Egypte ancienne. *Chronique d'Egypte*, 7, 31-39, 1932. ISIS

From the *Nieuwe Rotterdamsche Courant*, Sept. 20, 1931.

Peet, Thomas Eric. A comparative study of the literatures of Egypt, Palestine and Mesopotamia. Egypt's contribution to the literature of the ancient world. VII+136 p. (The Schweich Lectures of the British Academy 1929). London, MILFORD, 1931. ISIS

Reviewed by HANS BONNET, *DLZ*, 3, 634-35, 1932.

Pogo, Alexander. The astronomical inscriptions on the coffins of ḤENY (XIth dynasty ?). *Isis*, 18, 7-13, 2 fig., 1932. ISIS

" The fragments of the coffins of ḤENY (XIth dynasty ?) were discovered at Asyut in 1922 (see G. A. WAINWRIGHT and BATTISCOMBE GUNN, *Annales du service des antiquités de l'Égypte*, 26, 160-71, 1926). These fragments

confirm the hypothesis (see *Isis*, 14, 306, 1930) that the astronomical ceiling decorations in the tombs originated as astronomical inscriptions on coffins. The essential features of both the northern, and the southern panel are identified on the HENY fragments. The orientation of the panels is discussed."

3. — BABYLONIA AND ASSYRIA

Eilers, Wilhelm. Gesellschaftsformen im altbabylonischen Recht. XI+72 p. (*Leipziger rechtswiss. Studien*, hrsg. v. d. Leipziger Juristen-Fak. H. 65). Leipzig, WEICHER, 1931. ISIS

Reviewed by M. SAN NICOLÒ, *DLZ*, 3, 998-1001, 1932.

Neugebauer, O. Sexagesimalsystem und babylonische Bruchrechnung IV. *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*. Abteilung B : Studien, 2, 199-210, 7 fig., 1932. ISIS

Unger, Eckhard. Babylon. Die heilige Stadt nach der Beschreibung der Babylonier. XV+382 p., 57 pl., 1 map. Berlin, DE GRUYTER, 1931. ISIS

Reviewed by JULIUS LEWY, *DLZ*, 3, 1257-64, 1932.

4. — GREECE

Atkinson, Basil Ferris Campbell. The Greek language. 354 p. London, FABER, 1931. ISIS

Reviewed by A. P., *Journal des Savants*, 131-32, 1932.

Derenne, Eudore. Les procès d'impiété intentés aux philosophes à Athènes au V^e^ et au VI^e^ siècles. 271 p. Paris, CHAMPION, 1930. ISIS

Glotz, Gustave. Le prix du papyrus dans l'antiquité grecque. *Annales d'histoire économique et sociale*, 1, 3-12, 1929. ISIS

Herzog, Rudolf. Die Wunderheilungen von Epidauros. Ein Beitrag zur Geschichte der Medizin und der Religion. 164 p., 1 pl. (*Philologus*, Supplementband XXII, Heft III). Leipzig, DIETERICH, 1931. ISIS

Inhalt : 1. Einleitung; 2. Text und Übersetzung; 3. Weitere Wunder von Epidauros; 4. Redaktion, Quellen, Stil und Tendenz der Sammlung; 5. Kommentar : (1) Kindsnöte und Kindersegen; (2) Chirurgie; *a*) Operationen; *b*) Heilungen ohne operativen Eingriff; Eiterungen, Geschwüre und Ähnliches; Verwundungen; (3) Augenleiden; (4) Sprachstörungen; (5)

Lähmungen; (6) Verschiedene Krankheiten; (7)Mantik; (8) Erziehungs- und Strafwunder; (9) Weihgaben; 6. Asklepieion und ärztliche Praxis; Register.

Hoffmann, Ernst. Der pädagogische Gedanke bei den Sophisten und SOKRATES. *Neue Jahrbücher f. Wissenschaft u. Jugendbildung*, 6, 59-68, 1930. ISIS

Momigliano, Arnoldo. PRODICO DA CEO e la dottrina sul languaggio da DEMOCRITO ai Cinici. *Atti d. Accad. d. scienza di Torino*, 45, 95-107, 1930. ISIS

Nestle, Wilhelm. Griechische Geschichtsphilosophie. *Arch. f. Geschichte der Philosophie*, 41, 80-114, 1932. ISIS

Nilsson, Martin P. The Mycenaean origin of Greek mythology. 258 p. Berkeley, University of California, 1932. ISIS

Reviewed by CHARLES DUGAS, *Journal des Savants*, 228-29, 1932.

Richter, Gisela Marie Augusta. The sculpture and sculptors of the Greeks. XXIX+242 p., 767 fig. New Haven, Yale University Press, 1929. ISIS

Detailed review by ANDREAS RUMPF, *DLZ*, 3, 166-79, 1932.

Vogel, Kurt. Eine neue Quelle ältester griechischer Algebra. *Zeitschrift f. math. u. naturw. Unterr.*, 62, 266-71, 1931. ISIS

A propos des problèmes d'algèbre posés par le papyrus Michigan 620 (*Isis*, 5, 20-25, 1923). L. G.

Wright, Frederick Adam. A history of later Greek literature : from the death of ALEXANDER in 323 B.C. to the death of JUSTINIAN in 565 A.D. XI+415 p. London, ROUTLEDGE, 1932. ISIS

Reviewed by T. G., *Nature*, 130, 262, 1932.

5. — ROME

Burriss, Eli Edward. Taboo, magic, spirits : a study of primitive elements in Roman religion. X+250 p. New York, MACMILLAN, 1931. ISIS

Reviewed by EUGÈNE S. MCCARTNEY, *American Historical Review*, 37, 582, 1932.

Homo, Léon. La civilisation romaine. 470 p. 294 fig. Paris, PAYOT, 1930. ISIS

Reviewed by P. WUILLEUMIER, *Journal des Savants*, 60-67, 1932.

Poidebard, A. La trace de Rome dans le désert de Syrie. Le limes de Trajan à la conquête arabe. Recherches aériennes (1925-1931). Introduction de FRANZ CUMONT. 200 p., 20 fig., 176 pl., 20 maps. Paris, GEUTHNER, 1932. ISIS

Rostovtzeff, Michael. Gesellschaft und Wirtschaft im römischen Kaiserreich. Übers. v. LOTHAR WICKERT. 2 vols. XI+348 p., 422 p., pl. Leipzig, QUELLE & MEYER, 1929. ISIS

Reviewed by ERNST HOHL, *DLZ*, 3, 179-80, 1932.

Taylor, Lily Ross. The divinity of the Roman emperor. XV+296 p. (*Philological monographs*, published by the American Philological Association, edited by JOSEPH WILLIAM HEWITT, no. 1.) Middletown, Conn., American Philological Association, 1931. ISIS

Reviewed by CYRIL BAILEY, *American Historical Review*, 37, 732-33, 1932.

II. MIDDLE AGES

6. — MIDDLE AGES (*generalities*)

Barion, Hans. Das fränkisch-deutsche Synodalrecht des Frühmittelalters. XV+407 p. (*Kanonist. Studien u. Texte*, hrsg. v. A.M. KOENIGER, Bd. 5 u. 6.) Bonn, RÖHRSCHEID, 1931. ISIS

Reviewed by KARL HANS GANAHL, *DLZ*, 3, 565-69, 1932.

Betzendörfer, Walter. Glauben und Wissen bei den grossen Denkern des Mittelalters. Ein Beitrag zur Geschichte des Zentralproblems der Scholastik. VII+260 p. Gotha, KLOTZ, 1931. ISIS

Reviewed by WALTER DRESS, *DLZ*, 3, 1353-56, 1932.

Halphen, Louis. L'essor de l'Europe (XI-XIII^{e} siècles). Volume VI de *Peuples et civilisations*. Histoire générale publiée sous la direction de LOUIS HALPHEN et PHILIPPE SAGNAC. 612 p., Paris, ALCAN, 1932. (60 fr.). ISIS

Dans un volume antérieur de la même série intitulé : les Barbares, M.HALPHEN a étudié la grande révolution ethnique dont le vieux monde romain et les vieux empires asiatiques furent le théatre entre le V^{e} et le XI^{e} siècle de notre ère. Ce nouveau livre est consacré au laborieux effort de création de l'Europe et à son rapide développement face à l'Asie toujours menaçante. Les premiers siècles du Moyen-Age ont vu la transformation de la carte politique et ethnographique du monde,la disparition des vieux cadres romains, mais non la ruine définitive des principes de droit et de gouvernement sur lesquels reposait l'Empire. Ces principes survivaient, leur réapparition avec

l'idée d'État va être un des faits capitaux de l'histoire politique des XII^e^ et XIII^e^ siècles, comme le réveil de la pensée et de l'art antiques sera un des faits capitaux de l'histoire intellectuelle.

Le bénéfice que l'Europe retira de ses victoires sur l'islamisme ne fut pas seulement d'ordre matériel : elle lui dût par surcroît un immense élargissement de son horizon intellectuel (pp. 97-111, 539-68).

Les Arabes avaient clarifié les données de la science antique, démêlé les conséquences et perfectionné les méthodes. Ils étaient passé maîtres en médecine et avaient utilement complété les travaux des mathématiciens de la Grèce et de l'Inde. Ils avaient ranimé le goût de la recherche scientifique et compris que la science devait être placée au centre de la pensée philosophique. Ils ne concevaient la philosophie que comme l'aboutissement et le couronnement de la science. La science arabe allait exercer un irrésistible attrait sur l'esprit des Européens auxquels elle se trouve brusquement révélée grâce aux traductions latines des œuvres des savants arabes, lesquelles révélaient les Grecs à l'Europe et les commentaient.

On assiste à un brusque envol de la pensée philosophique; les systèmes s'opposent et s'entrechoquent et la grande lutte entre réalistes et nominalistes prouve combien s'est élargi le cercle de ceux qui s'intéressent aux choses de l'esprit.

Dans la deuxième moitié du XIII^e^ siècle, les esprits qu'on pensait amener à une doctrine commune échappent à la discipline : hommes et doctrines s'entrechoquent avec violence, l'Université fait montre d'une grande indépendance et d'une hardiesse inquiétante pour la Papauté. L'outrance que ROGER BACON apporte dans ses attaques contre les maîtres de Paris montre le caractère sérieux de la crise que traverse la pensée chrétienne et qui conduira aux grands conciles du XV^e^ siècle. L. S.

√**Hartley, Dorothy.** Mediaeval costume and life. XIV+142 p. London, BATSFORD, 1931. ISIS

Reviewed by M. CALBERG, *Bulletin des Musées Royaux d'Art et d'Histoire*, 4, 47-48, 1932.

Kenrick, Thomas Downing. A history of the Vikings. 412 p., 28 illus., 28 maps. London, METHUEN, 1930. ISIS

Reviewed by H. MARWICK, *Antiquity*, 5, 512-13, 1931.

Macnaughton, Duncan. Planetary positions on medieval maps. *Nature*, 129, 725-26, 1932. ISIS

Manitius, Maximilianus. Geschichte der lateinischen Literatur des Mittelalters. Dritter Teil, unter PAUL LEHMANNS Mitwirkung : Vom Ausbruch des Kirchenstreites bis zum Ende des zwölften Jahrhunderts. XIII+1164 p. (*Handbuch der Altertumswissenschaft*, begründet von IWAN VON MÜLLER, neu hrsg. von WALTER OTTO. IX. Abt., 2. Tl., 3. Bd.) München, BECK, 1931. ISIS

Reviewed by HANS PYRITZ, *DLZ*, 3, 971-76, 1932.

Millàs Vallicrosa, J. Assaig d'història de les idees físiques i matemàtiques a la Catalunya medieval, vol. I. Estudis Universitaris Catalans, sèrie monogràfica I, Barcelona, 1931. ISIS

Reviewed by LYNN THORNDIKE, *Isis*, 18, 203-04, 1932.

Pirenne, H. L'instruction des marchands au moyen-âge. *Annales d'histoire économique et sociale*, 1, 13-28, 1929. ISIS

Silva-Tarouca, Carolus (S.J.). Fontes historiae ecclesiasticae medii aevi in usum scholarum selegit CAROLUS SILVA-TAROUCA. Pars prima. Fontes saecc. V-IX. XV+544 p. Rome, Universitas Gregoriana, 1930. ISIS

Reviewed by FRIEDRICH SCHNEIDER, *DLZ*, 3, 1137-39, 1932.

Singer, Dorothea Waley; Anderson, Annie; Addis, Robina. Catalogue of Latin and vernacular alchemical manuscripts in Great Britain and Ireland dating from before the XVI century. Vol. 3. III+757-1179 p. Brussels, Union Académique Internationale, 1931. ISIS

Reviewed by R. S., *Nature*, 129, 419, 1932.

Thompson, James Westfall. The Middle Ages, 300-1500. Vol. 1. XXX+618 p. Vol. 2. VII+619-1069 p.+XLVI. Abridged edition, XII+466 p. London, KEGAN PAUL, 1931. ISIS

Reviewed by F. S. MARVIN, *Nature*, 129, 417-18, 1932.

Tout, Thomas Frederick. Chapters in the administrative history of mediaeval England. Vol. V. Manchester, University Press, 1930. ISIS

Reviewed by PETIT-DUTAILLIS, *Journal des Savants*, 85, 1932.

Willard, James F. Progress of medieval studies in the United States of America. Bulletin no. 10. 92 p. Boulder, Col., Medieval Academy of America and the University of Colorado, 1932. ISIS

"The tenth *Bulletin* extends its scope to include Canadian medievalists. It is interesting to note the number of persons listed in *Bulletin* 1 and the number in this present issue. In 1922 the *Bulletin* included sixty persons, while the present publication finds four hundred and ninety-nine medievalists listed."

Wingate, S. D. The mediaeval Latin versions of the Aristotelian scientific corpus, with special reference to the biological works. 136 p. London, Courier Press, 1931. ISIS

Reviewed by C. A. KOFOID, *Isis*, 18, 202-03, 1932.

III. ORIENTAL SCIENCE AND CIVILIZATION

8. — ASIA

Western Asia

Albright, William Foxwell. The archaeology of Palestine and the Bible. (The Richards Lectures delivered at the University of Virginia). 233 p. New York, REVELL, 1932. ISIS

Allen, Henry E. Factors in Turkey's cultural transformation. *The Open Court*, 46, 331-42, figs., 1932. ISIS

Dussaud, René ; Deschampes, P. ; Seyrig, H. La Syrie antique et médiévale illustrée. 22 p., 160 pl. (Haut-commissariat de la Républ. Franç. en Syrie et au Liban. Service des Antiquités et des Beaux-Arts, Bibl. Archéolog. et Histor. T. 17). Paris, GEUTHNER, 1931. ISIS

Reviewed by E. BICKERMANN, *DLZ*, 3, 131-33, 1932.

Edib, Halide. Woman's part in Turkey's progress. *The Open Court*, 46, 343-60, figs., 1932. ISIS

Garstang, John. The Hittite Empire. Being a survey of the history, geography and monuments of Hittite Asia Minor and Syria. XVII+ 364 p., 53 pl., map, fig. New York, SMITH, 1930. ISIS

Reviewed by BRUNO MEISSNER, *DLZ*, 3, 730-31, 1932.

Howard, Harry N. The reduction of Turkey from an empire to a national state. *The Open Court*, 46, 291-305, 1932. ISIS

(Olmstead, A. T.) Syria-Palestine, edited by A. T. OLMSTEAD. *The Open Court*, 46, 441-520, figs., 1932. ISIS

Contents : The land and its past, by A. T. OLMSTEAD; Social and economic trends in modern Syria, by SALLOUM A. MOKARZEL; Jewish Palestine, a study in " becoming," by JACOB RADER MARCUS.

Pottier, Edmond. L'art hittite. Second fascicule. 80 p., 51 fig. Paris, GEUTHNER, 1931. ISIS

Le premier fascicule (1926) a été analysé dans notre volume 10, p. 215. Le deuxième fascicule est une sorte de digression consacrée à la céramique de l'Asie orientale, et la substance en avait déjà été publiée dans le *Journal des Savants* de 1930 sous forme de comptes rendus des livres de H. DE GENOUILLAC, H. FRANKFORT et V. CHRISTIAN. G. S.

Speleers, Louis. Les fouilles en Asie antérieure à partir de 1843. VII+307 p., 57 pl. Liége, VAILLANT-CARMANNE, 1928. ISIS

Very useful contribution to the history of archaeological efforts in Western Asia since 1843. The main divisions are geographical : 1. Assyria; 2. Babylonia; 3. Persia-Elam; 4. Syria-Palestine; 5. Hittite country. Each locality or site is considered separately and dealt with in the following order : history of the locality, history of the excavations, their results. This helps one to realize the large quantity of work already undertaken and the immensity of that which still awaits to be done. This inventory is completed by chronological, geographical, and comparative tables of the excavations, indices, and 57 plates. A supplement to this book or a new edition of it will soon be needed; a considerable amount of work has been done during the last five years, as I was able to realize with my own eyes during the course of my oriental " Wanderjahr." G. S.

Sprengling, Martin. Modern Turkey. A scion, not a stage of Ottoman " Turkey." *The Open Court*, 46, 281-90, fig., 1932. ISIS

Central Asia

(Afghanistan et Chine). Exposition de récentes découvertes et de récents travaux archéologiques en Afghanistan et en Chine. 59 p., illus. Paris, Musée Guimet, 1925. ISIS

Afghanistan : Délégation archéologique française en Afghanistan. Travaux et documents de M. et Mme ANDRÉ GODARD, attachés à la mission en 1923. Chine : Travaux et documents archéologiques d'OSVALD SIRÉN. Travaux et documents archéologiques de JEAN LARTIGUE.

Osborn, Henry Fairfield. Arrest of geologic, archeologic and paleontologic work in Central Asia. *Science*, 74, 139-42, 1931. ISIS

Eastern Asia

(Including works relative to the whole of Buddhist Asia, or to India, Central and Eastern Asia combined.

Coomaraswamy, Ananda K. Introduction to the art of Eastern Asia. *The Open Court*, 42 p., 17 illus., March 1932. ISIS

Excellent introduction by a master of the subject. One would like to quote from it but one would have to quote too much, and anyone trying to understand Eastern thought (not only from the artistic angle but from any angle) should read it and meditate on it. G. S.

Haydon, A. Eustace. The heritage of Eastern Asia. *The Open Court*, 46, 137-84, figs., 1932. ISIS

India; the Buddhist heritage of Eastern Asia; The heritage of the Farther East.

9. — INDIA

Das, Lukumar Ranjan. La théorie des permutations et des combinaisons dans la Ganita hindoue. *Periodico di mat.*, 133-40, 1932. ISIS

Dasgupta, Surendranath. A history of Indian philosophy. Vol. 1. Second impression. XVI+528 p.; vol. 2, XI+620 p. Cambridge, University Press, 1932. ISIS

Vol. 2 reviewed by HELMUTH VON GLASENAPP, *DLZ*, 3, 1496-99, 1932.

Edgerton, Franklin. The elephant-lore of the Hindus. The elephant-sport (Matanga-lila) of NILAKANTHA. Translated from the original Sanskrit with introduction, notes, and glossary. XIX+129 p. New Haven, Yale University Press, 1931. ISIS

The Mātanga-līlā of Nīlakaṇṭha is the best available Sanskrit work on elephantology; it extends to 263 stanzas divided into 12 unequal chapters. The author is unknown; the work is undatable but probably ancient. Another Sanskrit treatise, the Hastyāyurveda (published in the Poona series, 1894, deals largely with elephants' diseases and their cures, the theory of Indian (human) medicine being adapted to these animals. The Mātanga-līlā was poorly translated into German by HEINRICH ZIMMER: Spiel um den Elefanten (München 1929), but ZIMMER's book includes a valuable appendix on comparative elephant lore.

The present treatise is a curious mixture of experimental and artificial knowledge. For example, the theories on the four castes of elephants, and their good and bad points seem to be arbitrary to a degree (compare similar ideas in Arabic literature with regard to camels and horses). The twelve chapters of the Mātanga-līlā deal respectively with: 1. mythology; 2. and 3. favorable and unfavorable marks; 4. marks of longevity; 5. stages of life; 6. measurements; 7. prices; 8. marks of character; 9. *must* (Skt. *mada*), a curious pathological condition of elephants, chiefly of males, which is probably analogous to the rut in deer, though more complex; 10. methods of catching elephants; 11. their keeping and their daily and seasonal regimen. This includes a few pathologic and therapeutic indications. "Most commonly, diseases of elephants are caused by worms." "Following the usual Hindu medical theory, diseases are attributed to disturbance of the equilibrium of the three bodily humors, wind, gall, and phlegm; the symptoms of disturbance affecting each of the three are severally described, and the next verse gives the characteristics of the healthy elephant whose humors are 'balanced.'" (p. 26); 12. miscellanea. The translation is followed by a glossary, a much needed addition as a relatively large number of words occur in meanings not hitherto recorded. The Hindus knew apparently nothing of the internal anatomy of the elephant. As to Western and even Islamic ignorance with regard to that noble animal it was truly amazing: witness the popular belief that its legs cannot be bent because they have no joints. See *Physiologus* and the Jāmi' al-ḥikāyāt of MUḤAMMAD 'AWFĪ, both quoted by J. STEPHENSON (*Isis*, 11, 298, 301). G. S.

Esser, A. Albert M. Die ophthalmologische Therapie des Bhāvaprakāśa (Der Ophthalmologie des Bhāvaprakāśa zweiter Teil). *Sudhoffs Archiv für Geschichte der Medizin*, 25, 184-213, 1932. ISIS

Gānguli, Sāradākānta. The Indian origin of the modern place-value arithmetical notation. *American Mathematical Monthly*, 39, 251-56, 1932. ISIS

Marshall, Sir John. Mohenjo-daro and the Indus civilization : an official account of the archaeological excavations carried out by the government of India, 1922-1927. 3 vols., LI+716 p., 164 pl., ill. London, PROBSTHAIN, 1931. ISIS

Pizzagali, A. M. La scienza indiana e il suo valore. *Scientia*, 51, 431-39, 1932. ISIS

Rele, Vasant Gangaram. The mysterious Kundalini ; the physical basis of the " Kundali (Hatha) Yoga " in terms of Western anatomy and physiology. Third revised and enlarged edition. XXVII+82+IV p., 4 pl. Bombay, Taraporevala, 1931. ISIS

Reviewed in *Isis*, 11, 224 (first edition, 1927); see also *Isis*, 13, 510 (second edition, 1929).

Rowlands, J. Helen. La femme bengalie dans la littérature du moyen-âge. VII+241 p. Paris, MAISONNEUVE, 1930. ISIS

Reviewed by REINHARD WAGNER, *DLZ*, 3, 678-79, 1932.

Sengupta, Probodhcha C. Hindu luni-solar astronomy. *Bull. Calcutta Math. Soc.*, 24, 18 p., 1932. ISIS

Sewell, R. B. Seymour. The zoological survey of India. *Nature*, 129, 530-32, 1932. ISIS

Suzuki, Daisetz Teitaro. Studies in the Lankāvatāra Sūtra. With a frontispiece (Bodhidharma, by MUCH'I). XXXII+464 p. London, KEGAN PAUL, 1932. ISIS

10. — CHINA

Carter, Thomas Francis (1882-1925). The invention of printing in China and its spread westward. XXVI+282 p., 40 illus. New York, Columbia University Press, revised edition, October 1931 ($ 5.00). ISIS

The first edition of this important publication (1925) was the subject of an elaborate review in *Isis*, 8, 361-73. In that review I was already able to announce the author's untimely death. The present edition contains a short biography by D. C. M. ending with the following statement: "Mr. CARTER himself considered this volume as only the first results of a research which he intended to carry much farther. As very little new material about the invention of printing in China has been published since his death more than five years ago, it has been considered better to reprint the book as it was left by Mr. CARTER and not to attempt a revised edition at this time. A correction has been made on page 12, and on pages 273 and 274 some titles, for which I am indebted chiefly to Dr. BERTHOLD LAUFER, have been added to the Bibliography." G. S.

Gardner, Charles S. A Union list of selected Chinese books in American libraries. IV+50 p. Washington, D.C., American Council of Learned Societies, 1932. ISIS

A select classified bibliography of 228 important Chinese works and a list of the holdings of the nine principal libraries of Chinese books in America.

Gomme, Allan. Ancient windmills. *Nature*, 129, 439, 1932. ISIS

Harada, Yoshito; Tazawa, Kingo. Lo-Lang: a report on the excavation of WANG HSÜ's tomb in the ancient Chinese colony in Korea. 148 p., 128 pl. Tokyo, The Tokoshoin, 1930 (Texts in English and Japanese). ISIS

Reviewed by SHIO SAKANISHI, *Antiquity*, 5, 521-22, 1931.

Lübke, Anton. Der Himmel der Chinesen. 141 p., fig., 39 pl. Leipzig, VOIGTLÄNDER, 1931. ISIS

Reviewed by E. ZINNER, *DLZ*, 3, 1096-98, 1932.

Shryock, John. The temples of Anking and their cults. A study of modern Chinese religion. 206 p., pl. Paris, GEUTHNER, 1931. ISIS

Reviewed by A. FORKE, *DLZ*, 3, 1307-08, 1932.

Soulié de Morant, George. L'acupuncture chinoise. *Mercure de France*, Paris, 1 avril 1932. ISIS

Wilhelm, Richard; Jung, C. G.; Baynes, Cary F. The secret of the golden flower: a Chinese book of life. Translated and explained by RICHARD WILHELM, with a European commentary by C. G. JUNG. Translated into English by CARY F. BAYNES. IX+151 p., 11 pl. London, KEGAN PAUL, 1931. ISIS

Reviewed by T. G., *Nature*, 129, 332, 1932.

12. — ISRAEL

Beyer, Hermann Wolfgang; Lietzmann, Hans. Jüdische Denkmäler I : Die jüdische Katakombe der Villa Torlonia in Rom. 47 p., 11 fig., 31 pl. (*Studien z. spätantiken Kunstgesch.* Im Auftr. d. Dtsch. Archäolog. Inst. hrsg. v. H. LIETZMANN u. G. RODENWALDT. Bd. 4). Berlin, DE GRUYTER, 1930. ISIS

Reviewed by KURT GALLING, *DLZ*, 3, 457-60, 1932.

Carpenter, Spencer Cecil. Politics and society in the Old Testament. 182 p. London, WILLIAMS & NORGATE, 1931. ISIS

Reviewed by F. HORST, *DLZ*, 3, 1393, 1932.

Jeremias, Alfred. Das Alte Testament im Lichte des Alten Orients. 4. (deutsche) völlig erneuerte Aufl. XVI+851 p., 293 fig., 3 maps. Leipzig, HINRICHS, 1930. ISIS

Reviewed by W. BAUMGARTNER, *DLZ*, 3, 390-95, 1932.

Lods, Adolphe. Israël : from its beginnings to the middle of the eighth century. Translated by S. H. HOOKE. XXIV+512 p., 16 pl. (*The History of Civilization Series*). London, KEGAN PAUL, 1932. ISIS

Moore, George Foot. Judaism in the first centuries of the Christian era, the age of the Tannaim. Vol. III. IX+206 p. Cambridge, Harvard University Press, 1930. ISIS

Reviewed by JOH. HEMPEL, *DLZ*, 3, 673, 1932.

Sukenik, E. L.; Mayer, L. A. The third wall of Jerusalem : an account of excavations. 76 p., 10 plans. Jerusalem, University Press, 1931. ISIS

Toussaint, Constant. Les origines de la religion d'Israël : l'ancien Jahvisme. 384 p., 24 pl. Paris, GEUTHNER, 1931. ISIS

Reviewed by J. B. CHABOT, *Journal des Savants*, 81-82, 1932.

14. — ISLAM

Gandz, Solomon. Bemerkungen zum " Buch über die Ausmessung der Ringe des AḤMAD IBN 'OMAR AL-KARĀBĪSĪ". *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik.* Abteilung B : Studien, 2, 98-105, 1932. ISIS

Hobson, R. L. Chinese porcelain from Fostat. *The Burlington Magazine*, 61, 109-13, 9 ill. on one plate, Sept., 1932. ISIS

The rubbish mounds of old Fostat contain many fragments not only of Egyptian ware but of Chinese as well. They even include occasional representatives of the Siamese celadon made at Sawankhalok. Fostat was finally destroyed in 1252 but the rubbish heaps continued to grow afterwards. The Chinese fragments are relatively late; one of the earliest bears a mark of the beginning of the fifteenth century. G. S.

Lévi-Provençal, E. Inscriptions arabes d'Espagne. 2 vols. XLI+ 227 p., 40 pl. Paris, LEYDE, 1931. ISIS

Reviewed by M. SOBERNHEIM, *DLZ*, 3, 921-23, 1932.

Mackensen, Ruth Stellhorn. Four great libraries of medieval Baghdad. *The Library Quarterly*, 2, 279-99, Chicago, 1932. ISIS

Very interesting account of a subject which had not yet received sufficient attention. Says the author (p. 280): "This article describes four of the great libraries of Baghdad and the institutions which housed them. The earliest is that of the famous AL MAMŪN, who was caliph from 813 to 833. Another was established by SĀBŪR IBN ARDASHĪR in 991 or 993 for the literary men and scholars who frequented his academy. Unfortunately, it was plundered and burned by the Seljuks about seventy years later. It is a good example of the sort of library built up out of the needs and interests of a literary society. The last two are examples of madrasa or theological college libraries. The Niẓāmīyah was founded by the Persian NIẒĀM AL MULK, who was vizier of two early Seljuk sultans. It continued undisturbed after the coming of the Mongols in 1258. The Mustanṣirīyah madrasa, which owned an exceedingly rich library, was the foundation of AL MUSTANṢIR, the second last Abbasid caliph, who died in 1242. This was the last great edifice built by the caliphs of Baghdad." G. S.

Meulen, D. Van der; Wissmann, H. von. Ḥaḍramaut. Some of its mysteries unveiled. 100 illus., maps. Leiden, BRILL. ISIS

Millàs i Vallicrosa, Josep. Textos màgics del Nord d'Africa. *Bulletí de la Associació Catalana d'Antropologia Etnologia i Prehistòria*, 1, 147-60, 1923. ISIS

Twenty short magical texts edited in Arabic and translated into Catalan, with notes and introduction. These texts were selected by the author from a collection made by one MUḤAMMAD AL-SERRADÍ AL-ḤAJJ, whom he met in Tetuan. They contain no bibliographical references except one to the magical encyclopaedia of AL-BUNI. G. S.

Montagne, Robert. Un magasin collectif de l'anti-atlas. L'agadir des Ikounka. 124 p., 32 pl., ill., map. Paris, LAROSE, 1932. ISIS

"Les berbères sédentaires du Sud du Maroc possèdent, comme les transhumants de l'Atlas Central et les Aurasiens, des forteresses de tribu dans lesquelles ils conservent leurs provisions alimentaires. Ces forteresses, connues sous le nom de *Gela'a* dans l'Aurès, d'*Igherm* dans l'Atlas Central marocain,

d'*Agadir* dans le Sous, sont, dans cette dernière région, régies par d'importants codes de droit coutumier en arabe, très anciens et très respectés. Les agadirs en arrivent ainsi à jouer un rôle considérable dans l'économie primitive et la vie politique des groupes sociaux. L'auteur étudie, grâce à des documents recueillis en tribu, une de ces forteresses, depuis sa fondation, à la fin du XVII[e] siècle, jusqu'à nos jours. Il compare ensuite les magasins collectifs du Sous à ceux des autres régions peuplées de berbères dans l'Afrique du Nord, ainsi qu'aux cavernes utilisées par les transhumants et les nomades berbères de l'Atlas Central et du Sahara. Une vue d'ensemble de l'institution en Afrique du Nord, depuis son aspect primitif jusqu'à sa décadence, semble permettre de croire que la fondation des magasins collectifs se trouve liée aux premières phases de la vie sédentaire et agricole chez les nomades; l'institution continuerait de se développer, cependant que s'affirmerait l'attachement des hommes à la terre; puis peu à peu, le village se substituant à la forteresse, l'agadir disparaîtrait au moment où, sous des formes encore très modestes, se préparerait dans le village berbère, la naissance de la cité."

Renaud, H. P. J. Additions et corrections à SUTER " Die Mathematiker und Astronomen der Araber." *Isis*, 18, 166-83, 1932. ISIS

" Les principales rectifications que j'apporte au livre de SUTER concernent donc les manuscrits scientifiques du fonds arabe de l'Escurial. Je les ai relevées moi-même à la suite de la mission qui me fut confiée de poursuivre la rédaction du catalogue français laissé inachevé par H. DERENBOURG. On sait aujourd'hui qu'une bonne partie de ce fonds provient de la bibliothèque privée du sultan sa'dien MOULAY ZÎDÂN, prise sur mer en 1612 par les Espagnols, alors en guerre avec le Maroc, et jamais rendue, malgré les efforts des diplomates. Il est donc naturel que je joigne à ces corrections des additions provenant des manuscrits, marocains pour la très grande majorité, rassemblés à Rabat, à la Bibliothèque générale du Protectorat français, depuis sa fondation jusqu'en 1920."

Ruska, Julius. Turba philosophorum : ein Beitrag zur Geschichte der Alchemie. x+368 p. (*Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin* : Fortsetzung des Archivs für Geschichte der Mathematik, der Naturwissenschaften und der Technik, hrsg. vom Institut für Geschichte der Medizin und der Naturwissenschaften. Redigiert von P. DIEPGEN u. J. RUSKA, Bd. 1.) x+368 p. Berlin, SPRINGER, 1931. ISIS

Reviewed by E. J. HOLMYARD, *Nature*, 129, 670-71, 1932.

Sarton, George. Al-'ulūm wal-'umrān fī-l-a'ṣur al-wusṭā khuṣūṣān fīmā yata'allaqu bil-tā'līf al-'arabīyat (Science and civilization in the Middle Ages with special reference to the Arabic writings). *Al-Kulliyyah*. Arabic Journal of the American University of Beirūt, 18, 270-74, Beirūt, May 1932 (in Arabic). ISIS

Orientalists may disregard this Arabic account which adds nothing to the author's own English publications. G. S.

Sidersky, D. Les origines des légendes musulmanes dans le Coran et dans les vies des prophètes. 230 p., Paris, GEUTHNER, 1932. ISIS

Stapleton, Henry H. Note on the Arabic Mss. on alchemy in the Āsafīyah library, Hyderābād (Deccan), India. *Archeion*, 14, 57-61, 1932. ISIS

La bibliothèque Āsafīyah renferme au moins 150 traités d'alchimie arabe dont 22 sont attribués à JABIR IBN HAYYĀN. Énumération de tous ces Mss. (Communication lue au II[e] Congrès d'histoire des sciences, Londres, 1931). L. G.

Thomas, Bertram. Arabia Felix : across the empty quarter of Arabia. With a foreword by T. E. LAWRENCE and appendix by Sir ARTHUR KEITH. XXIX+397 p., 48 pl. London, CAPE, 1932. ISIS

PART III

SYSTEMATIC CLASSIFICATION

Including only the material which could not be included in Parts I and II. Hence studies on Japanese astronomy or on XIIIth century astronomy are not classified below under astronomy, but above, respectively under Japan (in Part II) and S. XIII (in Part I).

I. SCIENCE IN GENERAL

16. — HISTORY OF SCIENCE

Brunet, Pierre. Enquête sur l'histoire des sciences dans l'enseignement. *L'Enseignement scientifique*, 5, 182-84, 1932. ISIS

Carmichael, Emmett B. The South's contribution to science. *Science*, 74, 421-27, 1931. ISIS

Address of the retiring president of the Alabama Academy of Science, University, Alabama, March 13, 1931.

(History of Science). Enquête sur l'histoire des sciences dans l'enseignement. *L'Enseignement scientifique*, 5, 209-15, 1932. ISIS

(History of Science Society). Eighth annual report of the Corresponding Secretary and Treasurer of the History of Science Society for the year 1931. *Isis*, 18, 5-6, 1932. ISIS

Lacroix, Alfred. Figures de savants. T. 1. x+326 p., 32 pl. T. 2. iv+358 p., 26 pl. Paris, GAUTHIER-VILLARS, 1932. ISIS

Lalande, A.; Rey, Abel. L'histoire des sciences dans l'enseignement. *L'Enseignement scientifique*, 5, 129-32, 1932. ISIS

Le Bon, Gustave. Bases scientifiques d'une philosophie de l'histoire. 325 p. Paris, FLAMMARION, 1931. ISIS

Reviewed by M. M. KNIGHT, *American Historical Review*, 37, 361-62, 1932.

Pelseneer, Jean. L'histoire de la science. *Revue de l'Université de Bruxelles*, 124-49, 1932. ISIS

Cette leçon inaugurale du cours d'histoire des sciences physiques et mathématiques à l'Université libre de Bruxelles (7 nov. 1931) nous a fait le plus grand plaisir : elle inaugure une nouvelle tradition qui, nous l'espérons, sera longue et glorieuse. G. S.

Ruggiero, Guido de. Science, history and philosophy. *Philosophy*, 6, 166-79, 1931. ISIS

Ruska, Julius. Weltbild und Naturforschung im Wandel der Zeiten. *Fortschritte der Medizin*, 50, 8 p., 1932. ISIS

" Und dennoch — müssen wir nicht gestehen, dass es letzte Fragen gibt, auf die uns die Naturwissenschaft keine Antwort geben kann? Wenn sich alles in der Welt in Elektronen auflöst — woher sind diese gekommen? Wenn sich alles Leben auf der Erde aus niederen Formen entwickelt hat — wie sind diese entstanden? Kann die Naturforschung verbieten, nach dem Woher und Wohin dieser Welt der Materie zu fragen? Kann sie uns die Frage nach dem Sinn unseres eigenen Daseins beantworten? Dass sie es n i c h t kann, ist ebenso offenkundig, wie dass der denkende Mensch sich immer wieder solche Fragen vorlegen wird. Dass auch die Philosophie nicht zu eindeutigen Antworten kommt, wissen wir alle : und so muss es dem einzelnen überlassen bleiben, ob er resigniert auf Antwort verzichtet oder in irgendeinem Glauben seinen Frieden zu finden sucht."

Sarton, George. The history of science and the new humanism. 178 p. New York, HOLT, 1928. ISIS

Reviewed by FREDERICK BARRY, *American Historical Review*, 37, 577-78, 1932; by E. J. HOLMYARD, *Nature*, 129, 418-19, 1932; by ERNST ZINNER, *DLZ*, 2, 2151-52, 1931; by HÉLÈNE METZGER, *Revue philosophique*, 114, 144-45, 1932; by G. DE GIULI, *Scientia*, 52, 248, 1932.

Sarton, George. Introduction to the history of science, II. From RABBI BEN EZRA to ROGER BACON. xxv+1278 p. Baltimore, WILLIAMS & WILKINS, 1931. ISIS

Reviewed by E. J. HOLMYARD, *Nature*, 130, 255-57, 1932; by EDMUND

O. VON LIPPMANN, *Chemiker-Zeitung*, 249, 1932; by HÉLÈNE METZGER, *Revue philosophique*, 114, 145-46, 1932; by HENRY DE VARIGNY, *Journal des Débats*, p. 3, le 18 août, 1932; by ARTURO CASTIGLIONI, *Riv. di storia d. sc. med. e natur.*, 23, 216-17, 1932.

Stimson, Dorothy. The development of the scientific point of view, a syllabus, second revised edition. 17 p. Baltimore, Maryland, 1932. ISIS

This syllabus, prepared for a senior course at Goucher College, gives many of the salient facts in the development of the scientific point of view from the time of primitive man through the nineteenth century. These scientific ideas are divided into four main sections, each one being prefaced by an outline of the geographical, political and economic conditions of that period.

The bibliographical sections are brief, being limited primarily to the books available at Goucher, but including many of the best and latest books on the subjects dealt with. M. C. W.

Tannery, Paul. Programme pour un cours d'histoire des sciences. *L'Enseignement scientifique*, 5, 135-40, 1932. ISIS

Programme proposé en 1892, publié en 1907. Accompagné d'une note de JULES TANNERY. A. P.

Vetter, Quido. L'enseignement de l'histoire des sciences en Tchécoslovaquie. *Archeion*, 13, 477-82, 1931. ISIS

18. — PHILOSOPHY OF SCIENCE

Darwin, Charles Galton. The new conceptions of matter. VIII+192 p., 6 pl. London, BELL, 1931. ISIS

Reviewed by HERBERT DINGLE, *Nature*, 130, 183-85, 1932.

Davis, Harold T. Philosophy and modern science. XIV+335 p., 9 fig. Bloomington, Indiana, Principia Press, 1931. ISIS

Reviewed by CAROL JANE ANGER, *Isis*, 18, 204-06, 1932.

Dingle, Herbert. Science and human experience. 141 p. London, WILLIAMS and NORGATE, 1931. ISIS

Reviewed by OLIVER LODGE, *Nature*, 129, 147-50, 1932.

Eddington, Sir Arthur. The decline of determinism. *Nature*, 129, 233-40, 1932. ISIS

Presidential address to the Mathematical Association delivered on Jan. 4, 1932.

Lenzen, Victor Fritz. The nature of physical theory : a study in

theory of knowledge. XII+301 p. New York, WILEY, 1931. ISIS

Reviewed by NORMAN R. CAMPBELL, *Nature*, 130, 40-41, 1932.

McDougall, William. World chaos : the responsibility of science. VI+119 p. London, KEGAN PAUL, 1931. ISIS

Reviewed by E. S. R., *Nature*, 129, 295-96, 1932.

Russell, Bertrand. The scientific outlook. 285 p. London, ALLEN and UNWIN, 1931. ISIS

Reviewed by E. S. R., *Nature*, 129, 295-96, 1932.

Tennant, Frederick Robert. Philosophy of the sciences : or The relations between the departments of knowledge. IX+191 p. Cambridge, University Press, 1932. ISIS

II. FORMAL SCIENCES
(Knowledge of forms)

20. — MATHEMATICS

Archibald, Raymond Clare. New mathematical periodicals. *American Mathematical Monthly*, 39, 185-87, 1932. ISIS

See *Isis*, 18, 495. The additional list of eight periodicals brings to forty the total of new mathematical periodicals started during the quinquennium 1926-30. The distribution of the 40 new periodicals is as follows : Roumania, 7; Italy, 6; Germany, Japan and Poland, 4 each; Argentina and the United States, 3 each; India and Russia, 2 each; Czechoslovakia, England, Holland, Hungary, and Switzerland, 1 each. A. P.

Archibald, Raymond Clare. Outline of the history of mathematics. 53 p. (*Bulletin* number 18 *of the Summer School for Engineering Teachers*), 1932. ISIS

A remarkably clear outline of the developments of mathematics; the Far East is not included, and the treatment of the XIXth century is necessarily very brief. The five millennia preceding the year 1600 are given as much space—22 pages—as the three centuries which follow it. The history of mathematics before the XVIIth century is divided into four parts : Babylonians and Egyptians (3500 to 600 B.C.), Greeks (600 B.C.—A.D. 500); Hindus, Arabs, and Persians (500-1200), and European mathematics (1200-1600). The history of mathematics after the XVIth century is divided into three parts corresponding to centuries. The chronological synopsis (3 pages) and the literature list (101 entries), are valuable additions to the survey. A. P.

Barbarin, P. Pour le centenaire de la géométrie non-euclidienne. 40 p., ill. Buenos Aires, CONI, 1931. ISIS

Dubislaw, Walter. Les recherches sur la philosophie des mathématiques en Allemagne. *Recherches philosophiques*, 1, 299-311, 1932. ISIS

1. Les problèmes mathématiques; 2. Les problèmes épistémologiques.

Gandz, Solomon. Der Hultsch-Cantorsche Beweis von der Reihenfolge der Buchstaben in den mathematischen Figuren der Griechen und Araber. *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik*, Abteilung B : Studien, 2, 82-97, 1 fig., 1932. ISIS

Grégoire, A. (S. J.). Les géométries non-euclidiennes. *R. des questions scientifiques*, 21, 361-400, 1932. ISIS

Hancock, Harris. Foundations of the theory of algebraic numbers. Vol. 1 : Introduction to the general theory. XXVII+602 p. New York, 1931. ISIS

Reviewed by L. J. MORDELL, *Nature*, 130, 76, 1932.

Lemoine, Jean-Gabriel. Les anciens procédés de calcul sur les doigts en Orient et en Occident. *Revue des Etudes Islamiques*, 1-60, 20 fig., 2 pl., 1932. ISIS

Étude importante suivie d'une bibliographie raisonnée et d'un texte inédit de IBN BUNDŪD communiqué par G. S. COLIN. Ce texte n'est pas daté mais parait ancien et pourrait remonter au XIV^e^ siècle. Une des planches reproduit des *tesserae* trouvées particulièrement en Égypte et en Italie et indique les nombres suivant le procédé décrit par BÈDE. G. S.

Miller, G. A. Group theory and the history of logarithms. *Journal of the Indian Mathematical Society*, 19, 169-72, 1931-32. ISIS

Miller, G. A. Twelve fundamental mathematical concepts. *Tôhoku Mathematical Journal*, 34, 230-35, 1931. ISIS

Miller, G. A. The word algebra. *Science*, 76, 14-15, 1932. ISIS

Ruska, Julius. HEINRICH WIELEITNER (geb. 31. X. 1874, gest. 27. XII. 1931). *Isis*, 18, 150-65, 1 pl., 1932. ISIS

Biography, elaborate bibliography, and portrait. G. S.

Segre, Beniamino. Rendiconti delle sedute degli anni accademici 1929-30 e 1930-31. Parte I—Conferenze. Seminario matematico della Facoltà di scienze, 7, 114 p., 1931. ISIS

III. PHYSICAL SCIENCES
(Knowledge of inorganic nature)

22. — MECHANICS
(Including celestial and atomical mechanics)

Larmor, Sir Joseph. The dynamical theory of tides. Historical origins. Letter to the Editor published in the *London Times* of June 10, 1932, p. 15. ISIS

23. — ASTRONOMY

Dingle, Herbert. The origin of the solar system. *Nature*, 129, 333-35, 1932. ISIS

"We end, therefore, where we began; the latest, like the earliest, known theory attributes our existence to the impact of another cosmic body on the primitive sun."

Guthe, Carl E. The Maya lunar count. *Science*, 75, 271-77, 1932. ISIS

Jeans, Sir James. Les étoiles dans leurs courses. Traduit de l'anglais par A. SALLIN. XII+206 p., 47 pl., 2 cartes, Paris, HERMANN, 1932 (35 fr.). ISIS

Sir JAMES JEANS a appliqué une fois de plus ses qualités exceptionnelles d'originalité et de simplicité dans la rédaction de cette introduction à l'étude de « l'astronomie moderne et des merveilles de l'univers vu à travers les télescopes géants d'aujourd'hui ». I. La voûte céleste; II. Voyage préliminaire à travers l'espace et le temps; III. La Famille du soleil; IV. Poids et dimensions des étoiles; V. La variété des étoiles; VI. La Voie lactée; VII. Dans les profondeurs de l'espace; VIII. Le grand univers. Appendices : I. Le guide du ciel; II. Les vingt plus brillantes étoiles en apparence; III. Les planètes; IV. Le mouvement des planètes. (Édition anglaise, *Isis*, 17, 579). L. G.

Lindblad, Bertil. The rotation of the galaxy. *Scientia*, 51, 325-34, 1932. ISIS

Morehouse, D. W. Astronomy's contribution to the stream of human thought. *Science*, 75, 27-32, 1932. ISIS

Zinner, Ernst. Untersuchungen zur Geschichte der Sternkunde. XXVI. *Bericht der Naturforschenden Gesellschaft* in Bamberg, 62 p., 2 fig., 1932. ISIS

Inhalt : I. Die frühgermanische Sternkunde; II. Die Orientierungstheorie;

III. Vor der Erfindung der Raederuhr; IV. Die alten Masse am Bamberger Dom; V. Kulturkurven; VI. Nachtrag zu dem Aufsatz „Alte Sonnenuhren an Bamberger Gebäuden". Literaturverzeichnis.

24. — PHYSICS

Audubert, René. Les piles sensibles à l'action de la lumière, leur mécanisme et leurs applications. 48 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 28 mai 1931.

Auger, Pierre. L'effet photo-électrique des rayons X dans les gaz. 28 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 23 avril 1931.

Bedeau, F. Le quartz piézo-électrique ; ses applications à la T. S. F. 32 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 8 mai 1931.

Boll, Marcel. Exposé électronique des lois de l'électricité. 72 p., 22 fig. Paris, HERMANN, 1932. ISIS

Exposé succint et systématique des lois de l'électricité, telles qu'elles sont conçues aujourd'hui. Excellent. L. G.

Broglie, Louis de. La représentation simultanée des possibilités dans la nouvelle physique. *R. de métaphysique et de morale*, 39, 149-52, 1932. ISIS

Broglie, Maurice de. Les récents progrès de la désintégration artificielle des éléments par bombardement de rayons. 32 p., 1 pl. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 29 avril 1931.

Curie, Irène ; Joliot, F. La projection de noyaux atomiques par un rayonnement très pénétrant : l'existence du neutron. (Exposés de physique théorique publiés sous la direction de LOUIS DE BROGLIE, 11). 22 p. Paris, HERMANN, 1932. ISIS

Haas, Arthur. Das Naturbild der neuen Physik. 130 p., 8 fig. Berlin, DE GRUYTER, 1932. ISIS

Reviewed by EDMUND O. VON LIPPMANN, *Chemiker-Zeitung*, 56, 198, 1932.

Johnson, E. H. Courses on the history of physics in American college and universities. *Science*, 74, 435-37, 1931. ISIS

Le Corbeiller, Ph. Les systèmes autoentretenus et les oscillations de relaxation. 46 p. Paris, HERMANN, 1931. ISIS

Conférences faites au Conservatoire des arts et métiers les 6 et 7 mai 1931.

Lenzen, Victor F. The nature of physical theory. 301 p. New York, WILEY, 1931. ISIS

Reviewed by LEIGH PAGE, *Science*, 76, 145-46, 1932.

Luria, S. Die Infinitesimaltheorie der antiken Atomisten. *Quellen und Studien zur Geschichte der Mathematik, Astronomie und Physik.* Abteilung B : Studien, 2, 106-85, 3 fig., 1932. ISIS

Maurer, K. Die Romantik des Messens. 79 p. (Technische Bücher für Alle.) Stuttgart, DIECK, 1932. ISIS

Pérard, M. A. La haute précision des mesures de longueur au laboratoire et dans l'industrie. 32 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 22 avril 1931.

Perrin, Francis. Fluorescence ; durée élémentaire d'émission lumineuse. 44 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 28 avril 1931.

Richtmyer, F. K. The romance of the next decimal place. *Science*, 75, 1-5, 1932. ISIS

Thomson, Sir J. J. The growth in opportunities for education and research in physics during the past fifty years. *Science*, 74, 317-24, 1931. ISIS

Trillat, J. J. Les applications des rayons X à l'étude des composés organiques. 22 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 4 mai 1931.

Trillat, J. J. L'état liquide et les états mésomorphes. 24 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 5 mai 1931.

Windred, G. The relation between pure and applied electrical theory : with special reference to mathematical methods. *Isis*, 18, 184-90, 1932. ISIS

" The history of electrical theory contains many examples of the manner in which pure science has produced discoveries of great practical importance. It is the object of the present paper to trace, by means of an historical retro-

spect, some of the more important of these developments. There is an unfortunate deviation between the views of the theorist and the practitioner concerning the usefulness of theoretical investigations. A study of the history of electrical theory shows that in reality these two classes are closely related; the progress of electrical practice having its foundation in pure theory."

25. — CHEMISTRY, PHYSICO-CHEMISTRY, INDUSTRIAL CHEMISTRY

André, Emile. Histoire du développement de la chimie des corps gras. *Bul. soc. chimique de France*, 1-29, 145-70, 1932. ISIS

Cola, Félix. Le parfum à travers les âges. Illustrations d'HENRY DE RENAUCOURT. 780 p., illus., pl. Paris, CASTERMAN, 1931. ISIS

Reviewed by JEAN HESSE, *Larousse mensuel illustré*, 8, 873-75, 1931.

Darmois, Eugène. L'hydrogène est un mélange : ortho et parahydrogène. 24 p. Paris, HERMANN, 1931. ISIS

Conférence faite au Conservatoire des arts et métiers le 12 mai 1931.

Meissner, W. Walter. Chemischer Handatlas : anorganische Chemie unter besonderer Berücksichtigung von Atomphysik und Atomchemie. Graphische Darstellung der Eigenschaften chemischer Elemente und ihrer Verbindungen nach der Anordnung des natürlichen Systems der Elemente auf 60 vielfarbigen Karten mit Beschriftung in deutscher, englischer, französischer, italienischer, spanischer Sprache nebst ausführlichem, erläuterndem Texte. XI+137 p. Braunschweig, WESTERMANN, 1931. ISIS

Reviewed in *Nature*, 129, 851-52, 1932.

Partington, J. R. Gunpowder. *Isis*, 18, 191, 1932. ISIS

Footnote to LIPPMANN's paper in *Isis*, 11, 429. G. S.

Ruska, J. Quelques problèmes de littérature alchimiste. Traduit par AD. KUENZI. *Annales Guébhard-Séverine*, 7, 156-73, 1931. ISIS

" Cet exposé résoud sans doute la question que nous nous posions au début : l'alchimie est-elle une erreur, une folie, ou a-t-elle été l'avenue qui a fini par aboutir à la chimie ? L'étude des sources démontre que la faculté d'observer et de reconnaître les faits est allée croissant de siècle en siècle; l'espoir de s'enrichir a stimulé des légions de chercheurs, les a poussés vers des tentatives toujours nouvelles; les expériences qu'ils ont faites ont constamment accru le nombre des corps connus. Il n'y avait pas d'autre voie pour conduire de l'étroit horizon de l'alchimie à l'actuelle science de la chimie."

Pour l'envoi gratuit des *Annales* s'adresser à l'Institut Guébhard-Séverine, 4, rue du Seyon, Neuchâtel, Suisse.

Ruska, J. SAL ALEMBROTH. Festschrift für GEORG JACOB zum siebzigsten Geburtstag, 234-40, 1932. ISIS

Testi, Gino. Gli studi storici della chimica in Italia. Comunicazione alla Sociedade de Pharmacia e Chimica di São Paulo (Brasile), 14 p., 1932. ISIS

Zuretti, C. O. (d. 1931). Alchemistica signa. VIII+84 p., 17 pl. (Catalogue des manuscrits alchimiques grecs, publié sous la direction de J. BIDEZ, F. CUMONT, A. DELATTE, Sir FREDERIC KENYON, LAGERCRANTZ, J. RUSKA, et C. O. ZURETTI. VIII). Bruxelles, Union académique internationale, 1932. ISIS

A study of the alchemical signs listed in the following seven Mss. : Marcianus 299, Vaticanus 1174, Bononiensis 3632, Scorialensis III Y 14, Scorialensis I R 14, Laurentianus, 86, 16, and Vaticanus 1134. Seventeen plates give photographic reproductions of these lists; their complete transcription (p. 1-24) gives a clear tabulation of about 550 different alchemical signs and of their Greek equivalents (total number of entries : 1332). The signorum descriptio (in Latin, p. 25-72) is a valuable palaeographical study of the tabulated alchemical signs. An alphabetical index of the Greek words mentioned in the tables occupies a dozen two-column pages (p. 73-84).

A. P.

26. — TECHNOLOGY

(*For Mining, see* 32. *Geology*; *for Industrial chemistry*, 25. *Chemistry*. *See also Arts and crafts under* 45)

Fertig, George J. The development of scientific research in the South. *Science*, 75, 595-99, 1932. ISIS

Leser, Paul. Entstehung und Verbreitung des Pfluges. XV+677 p., 351 fig., 22 pl. (*Anthropos*. Ethnolog. Bibl., internat. Sammlg. ethnolog. Monographien. Hgg. : P. WILH. SCHMIDT u. WILH. KOPPERS, S. V. D., Bd. 3, H. 3.) Münster i. W., ASCHENDORFF, 1931.

Reviewed by GUSTAV FISCHER, *DLZ*, 3, 471-74, 1932.

Lippmann, Edmund O. von. Geschichte der Magnetnadel bis zur Erfindung des Kompasses (gegen 1300). 49 p. (*Quellen und Studien zur Geschichte der Naturwissenschaften und der Medizin*; hrsg. vom Institut für Geschichte der Medizin und der Naturwissenschaften ; redigiert von P. DIEPGEN und J. RUSKA. Bd. 3, H. 1). Berlin, SPRINGER, 1932. ISIS

Zusammenfassung: „1. In China ist bisher die Kenntnis der Magnetnadel vor Beginn des 11. Jahrh. n. Chr. nicht sicher erwiesen, und die ihrer Benützung zu Zwecken der Schiffahrt wurde frühestens erst 1086 durch 'Fremde' verbreitet, die aus Sumatra nach Kanton kamen. Ob und inwieweit im nördlichen China die Bekanntschaft mit der Nadel und ihre Verwendung zu anderen als magischen Gebräuchen hinter die Zeitgrenze des 11. Jahrh. zurückreicht, wird sich erst bestimmen lassen, wenn die Prüfung der vorliegenden chinesischen Literatur auf Glaubwürdigkeit genügend weit fortgeschritten ist. 2. Weder die eingeborenen Inder, noch die Griechen und Römer der alten und hellenistischen Zeit, noch die Byzantiner des frühen Mittelalters wussten etwas von der Magnetnadel. 3. Die Araber erfanden sie weder selbständig, noch besassen sie sie im 8., 9. oder 10. Jahrh., und der älteste gesicherte arabische Bericht liegt (wohl zufällig?) erst aus dem Jahre 1242 vor. 4. In Europa (vom hohen Norden abgesehen) ist die Anwendung der Magnetnadel als Seeweiser und im Bergbau um 1200 schon seit längerem gut bekannt, auch Schriftstellern und Dichtern. Ihre Verbindung mit der Wind- oder Strichrose zur Bussole dürfte sich um oder bald nach 1250 in Süditalien vollzogen haben, und deren Umgestaltung zum Kompass, durch Benützung einer Bussole, und zwar einer noch recht unvollkommenen, findet sich 1269 bei MARICOURT, das erste Vorkommen des Wortes Kompass ist anscheinend erst gegen 1300 zu belegen, und zwar in einem Gedichte BARBERINOS und in angeblichen Schriften des RAIMUND LULL. 5. Der Name calamita für Magnetnadel leitet sich vom griechischen *κάλαμος* ab, ist in Süditalien schon um 1200 gebräuchlich, stammt wohl aus den Kreisen dortiger, griechisch sprechender Schiffer, und geht von der Magnetnadel auch auf den Magnetstein über; er verbreitet sich aus seiner Heimat nach den benachbarten und den übrigen europäischen Ländern, und in der arabischen Form *qaramīṭ* auch nach dem Orient. Von einem griechischen Worte *πυξίς* her führt die Bussole ihren ursprünglichen Namen *bussula* oder *bussola*, während Kompass in seiner anfänglichen Bedeutung auf das spätlateinische *compaginare* zurückgehen dürfte. 6. Im Norden Europas wurde die Magnetnadel vermutlich schon in frühmittelalterlicher Zeit selbständig entdeckt; ausschlaggebend für ihre Verbreitung waren die Normannen, insbesondere jene Stämme, die zu Beginn des 11. Jahrh. das normannische Reich in Sizilien und Süditalien begründeten."

Vowles, Hugh P. Ancient windmills. *Nature*, 129, 317, 1932. ISIS

Vowles, Hugh P.; Vowles, Margaret W. The quest for power: from prehistoric times to the present day. XV+354 p., 88 pl. London, CHAPMAN and HALL, 1931. ISIS

Reviewed in *Nature*, 129, 380-81, 1932.

IV. BIOLOGICAL SCIENCES
(Knowledge of organic nature)

27. — BIOLOGY
(*Generalities*, " *Natural history* ")

Almquist, Ernst. Grosse Biologen. Eine Geschichte der Biologie und ihrer Erforscher. 143 p., 23 portraits. München, LEHMANN, 1931. ISIS

Reviewed by CHARLES A. KOFOID, *Isis*, 18, 206-07, 1932.

Bodenheimer, F. S. Der Massenwechsel in der Tierwelt. Grundriss einer allgemeinen tierischen Bevölkerungslehre. *Archivio zoologico italiano*, 16, 98-111, figs., 1931. ISIS

Ludwig, Wilhelm. Das Rechts-Links-Problem im Tierreich und beim Menschen : mit einem Anhang, Rechts-Links-Merkmale der Pflanzen. XI+496 p. (*Monographien aus dem Gesamtgebiet der Physiologie der Pflanzen und der Tiere*, Bd. 27). Berlin, SPRINGER, 1932. ISIS

Needham, Joseph. Chemical embryology. 3 vols. Vol. 1 : XXII+ 613 p., 11 pl. Vol. 2 : XVI+615-1253 p., 3 pl. Vol. 3 : XVI+ 1255-2021 p., 1 pl. Cambridge, University Press, 1931. ISIS

Reviewed by J. S. H., *Nature*, 129, 183-85, 1932. " Part ii., comprising nearly two hundred pages, is an extremely able and detailed account of the origins of chemical embryology, which, it may be prophesied, will long remain the best history of the subject."

Nieuwenhuis, A. W. Urformen des naturwissenschaftlichen Denkens und der Naturauffassung auf dem amerikanischen Festlande. *Janus*, 36, 27-42, 49-58, 93-113, 146-68, 190-201, 1932. ISIS

Poulton, E. B. A hundred years of evolution. *Science*, 74, 345-60, 1931. ISIS

Streeter, George L. Development of the egg as seen by the embryologist. *Scientific Monthly*, 32, 495-506, 7 figs., 1931. ISIS

28. — BOTANY
(*Agronomy, phytopathology, palaeobotany*)

(Botanists). International address book of botanists : being a directory of individuals and scientific institutions, universities, societies, etc.,

in all parts of the world interested in the study of botany. Prepared in accordance with a resolution passed at the Fifth International Botanical Congress, Cambridge, 1930. XV+605 p. London, BAILLIÈRE, TINDALL, and COX, 1931. ISIS

Reviewed in *Nature*, 129, 563, 1932.

Britten, James ; Boulger, George S. A biographical index of deceased British and Irish botanists. Second edition, revised and completed by A. B. RENDLE. XXII+342 p. London, TAYLOR and FRANCIS, 1931. ISIS

Reviewed in *Nature*, 129, 563, 1932.

Krumbiegel, Ingo. Die Akelei (Aquilegia). (Eine Studie aus der Geschichte der deutschen Pflanzen). *Janus*, 36, 129-45, 1932. ISIS

Netolitzky, Fritz. Unser Wissen von den alten Kulturpflanzen Mittel-Europas. 20. Bericht d. Römisch-Germanischen Kommission d. Deutschen Archaeologischen Instituts, 14-76, 1931. ISIS

Rohde, Eleanour Sinclair. Oxford's college gardens. With 24 illustrations in colour, and one black and white by ESTELLA CANZIANI and 7 illustrations in monotone from Oxonia Illustrata by D. LOGGAN and Oxonia depicta, by W. WILLIAMS. London, JENKINS, 1932. ISIS

Rübel, E. Bericht über das geobotanische Forschungsinstitut Rübel in Zürich 1931. 42 p. Zürich, 1932. ISIS

Stapf, O. Index Londinensis to illustrations of flowering plants, ferns and fern allies, being an emended and enlarged edition continued up to the end of the year 1920 of PRITZEL's Alphabetical register of representations of flowering plants and ferns compiled from botanical and horticultural publications of the XVIIIth and XIXth centuries. Prepared under the auspices of the Royal Horticultural Society of London at the Royal Botanic Gardens, Kew. 6 vols. Oxford, Clarendon Press, 1931. ISIS

Reviewed in *Nature*, 129, 459-60, 1932.

Stevens, Neil E. The fad as a factor in botanical publication. *Science*, 75, 499-504, 1932. ISIS

Tiberghien, Albert. Phytotypie et phytotypes. Notice sommaire, bibliographique et historique sur l'impression des plantes à l'aide

des plantes elles-mêmes. *Bulletin de la Société Royale de Botanique de Belgique*, 64, 81-91, 1931. ISIS

Williamson, George Charles. The book of amber. With a foreword by EDWARD HERON-ALLEN. 268 p., 5 pl. London, BENN, 1932. ISIS

Reviewed in *Nature*, 130, 44, 1932.

29. — ZOOLOGY

Coles, Robert R. Hippocampus the elusive. Ancient and present-day knowledge concerning the sea horse. *Natural History*, 32, 181-87, 9 figs., 1932. ISIS

Maeterlinck, Maurice. The life of the ant. Translated by BERNARD MIALL. 192 p. London, CASSELL, 1930. ISIS

Reviewed in *Nature*, 129, 79-80, 1932.

(Whaling records). Past and present whaling records. *Bull. New York Zool. Soc.*, p. 173, 1931. ISIS

Reviewed in *Nature*, 129, 443-44, 1932.

Wheeler, William Morton. Demons of the dust : a study in insect behaviour. XVIII+378 p. London, KEGAN PAUL, 1930. ISIS

Reviewed by J. STANLEY GARDINER, *Nature*, 129, 39-40, 1932.

Wood, Casey Albert. An introduction to the literature of vertebrate zoology : based chiefly on the titles in the Blacker Library of zoology, the Emma Shearer Wood Library of Ornithology, the Bibliotheca Osleriana, and other Libraries of McGill University, Montreal. XIX+643 p. Oxford, University Press, 1931. ISIS

Reviewed by F. J. COLE, *Nature*, 130, 111-12, 1932; by C. A. KOFOID, *Isis*, 18, 207-08, 1932.

V. SCIENCES OF THE EARTH

(Implying knowledge of both organic and inorganic nature)

31. — GEOGRAPHY AND OCEANOGRAPHY

Bowman, Isaiah. The pioneer fringe. IX+361 p., 249 figs. (*American Geographical Society*, special publication no. 13). New York, 1931. ISIS

A study of the pioneer or " experimental " zones all over the world. " The pioneer lands of the world are of great extent. They are to be found in

every continent. They include some of the best soil and some of the most promising young communities. One must also admit that some pioneer regions have become 'slums of settlement.' It is the purpose of this book to sketch the outlines of a 'science of settlement,' to set forth the ideas that have moved men to take such diverse paths, and to provide a description of the different environments in which so many men elect to meet destiny." (p. vi). The book is divided into two main parts, the first dealing with generalities, the second with particular zones in the United States, Canada, Australia, S. Africa, Siberia, Mongolia, Manchuria, and S. America. Very well illustrated. A stimulating book. G. S.

Bowman, Isaiah. The pioneering process. *Science*, 75, 521-28, 1932. ISIS

Hassinger, Hugo. Geographische Grundlagen der Geschichte. XIII+331 p., maps, bibliog., index. (*Geschichte der führenden Völker*, hrsg. von HEINRICH FINKE, HERMANN JUNKER, GUSTAV SCHNÜRER, vol. 2). Freiburg im Breisgau, HERDER, 1931. ISIS

Reviewed by WALTER WOODBURN HYDE, *Geographical Review*, 22, 337-39, 1932.

Hermannsson, Halldór. The cartography of Iceland. VII+81 p., 27 pl. (*Islandica*: an annual relating to Iceland and the Fiske Icelandic Collection in Cornell University Library, vol. 21). Ithaca, 1931. ISIS

Reviewed by HANS KUHN, *DLZ*, 3, 947-51, 1932.

Miller, Konrad. Die ältesten Separatkarten der drei Erdteile. Stuttgart, Selbstverlag, 1931. ISIS

Reviewed by H. HASSINGER, *DLZ*, 3, 804-06, 1932.

Paullin, C. O. Atlas of the historical geography of the United States. XIV+145 p., 166 pl., index. New York, Carnegie Institution of Washington and the American Geographical Society, 1932. ISIS

Detailed review by JOHN K. WRIGHT, *Geographical Review*, 22, 353-60, map, 1932.

Semple, Ellen Churchill. The geography of the Mediterranean region: its relation to ancient history. IX+737 p., maps, bibliogr., index. New York, HOLT, 1931. ISIS

Reviewed by DERWENT WHITTLESEY, *Geographical Review*, 22, 336-37, 1932.

Southworth, Constant. The French colonial venture. XI+204 p., illus., index. London, KING, 1931. ISIS

Reviewed by MARK JEFFERSON, *Geographical Review*, 22, 339-40, 1932.

(**Wind rose**) (*Introduction*, II, 1048). For the Greek wind roses, see also ERNST HONIGMANN : Die sieben Klimata (Heidelberg, 1929, p. 3, note 2 ; *Isis*, 14, 270-76). ISIS

32. — GEOLOGY, MINERALOGY, PALAEONTOLOGY, MINING

(*For Palaeobotany, palaeozoology and palaeoanthropology, see respectively* 28. *Botany*, 29. *Zoology and* 39. *Prehistory*

Bessmertny, Alexander. Das Atlantisrätsel. Geschichte und Erklärung der Atlantishypothesen. 212 p., 29 fig., 8 pl. Leipzig, VOIGTLÄNDER, 1932. ISIS

(**Kunz, George Frederick**, 1856-1932). American mineralogist, author of many books of historical interest : Book of the pearl (1908), Curious lore of precious stones (1913), Magic of jewels and charms (1915), Rings (1917). Obituary by H. P. W. in *Natural History*, 32, 554, 1932, with portrait. G. S.

33. — METEOROLOGY, CLIMATOLOGY, AND TERRESTRIAL PHYSICS

Shaw, Sir **Napier ; Austin, Elaine.** Manual of meteorology. Vol. I : Meteorology in history. Second impression. XX+344 p. Cambridge, University Press, 1931. ISIS

Shaw, Sir **Napier.** The meteorology of yesterday, to-day and to-morrow. *Scientia*, 51, 393-404, 1932. ISIS

VI. ANTHROPOLOGICAL AND HISTORICAL SCIENCES

(Knowledge of man, past and present)

34. — ANATOMY

Favaro, G. Prossimi centenari di tre grandi anatomici italiani. *Atti della Società Italiana di Anatomia*, 79-91, 1930. ISIS

Apropos of JACOPO BERENGARIO (d. Nov. 24, 1530); ANTONIO SCARPA (b. May 19, 1752, not June 13, 1747; d. Oct. 31, 1832); and GIROLAMO FABRICI D'ACQUAPENDENTE (b. 1533, not 1536; d. May 21, 1619). A. P.

37. — PSYCHOLOGY

(*human and comparative*)

Müller-Freienfels, Richard. Les tendances principales de la psycho-

logie allemande d'aujourd'hui. *Recherches philosophiques*, 1, 312-21, 1932. ISIS

(Murchison, Carl). A history of psychology in autobiography. Vol. 2. By BENJAMIN BOURDON, HARALD HÖFFDING, JAMES DREVER, CHARLES H. JUDD, KNIGHT DUNLAP, C. LLOYD MORGAN, GIULIO CESARE FERRARI, WALTER B. PILLSBURY, SHEPHARD IVORY FRANZ, LEWIS M. TERMAN, KARL GROOS, MARGARET FLOY WASHBURN, GERARDUS HEYMANS, ROBERT S. WOODWORTH, ROBERT MEARNS YERKES. XVII+407 p. (The International series in psychology). Worcester, Massachusetts, Clark University Press, 1932. ISIS

Saussure, Raymond de. Psychologie de la pensée scientifique. *Annales Guébhard-Séverine*, 7, 151-55, 1931. ISIS

Vilhena, Henrique de. A expressão física da cólera na literatura. 2ª edição. 431 p. Instituto de Anatomia da Faculdade de Medicina de Lisboa, 1930. ISIS

The author of this valuable essay is the founder and editor of the *Arquivo de anatomia e antropologia*, Lisbon. The first edition of the book appeared in Lisbon, in 1909, under the title *A expressão da cólera na litteratura*, with the subtitle Ensaio de critica literaria, scientifica e artistica. Of all the human emotions and passions, the author has chosen the one which is the avowed subject of the Iliad; the essay is limited to the consideration of its expressions in literature only. The essay is therefore a welcome addition to the series of similar books by CH. BELL, CH. DARWIN, G. B. DUCHENNE, LESSING, CH. LETOURNEAU, P. MONTEGAZZA, TH. PIDERIT, TAINE, and many others. The range of literary works analyzed by the author is wide—from the Bible to DOSTOYEVSKI—but the Greek tragedies and the great epics of southern Europe furnish most of the material; the literary masterpieces of central and northern Europe are neglected. The numerous references are very carefully treated; there is an alphabetical name and subject index, and an extensive analytical table of contents (a reprint of the chapter summaries). A. P.

40. — ETHNOLOGY

(Primitive and popular science)

Baschmakoff, Alexandre. L'évolution de la charrue à travers les siècles au point de vue ethnographique. *L'anthropologie*, 42, 82-90, 1932. ISIS

Brocher, Henri. Le mythe du héros et la mentalité primitive. 126 p., *Bibl. de philosophie contemporaine*, Paris, ALCAN, 1932. ISIS

" Le but du présent ouvrage est d'étudier les anciens mythes grecs, principalement les légendes des héros, à la lumière des récentes découvertes

des écoles ethnologiques anglaises et françaises. » (FRAZER et LÉVY-BRUHL en particulier). Le sujet principal est le thème du parricide, qui fait le fond de la légende d'Œdipe, et que l'on retrouve également dans celles de Thésée, Persée; l'auteur en groupe un grand nombre d'autres autour de celles-ci, et conclut que « l'origine du mythe ne doit pas être cherchée dans l'observation des grands phénomènes de la nature, non plus que dans certaines tendances sexuelles refoulées, comme le voudraient FREUD et son école, mais bien dans les croyances qui ont gouverné l'homme dès le début de son évolution », croyances qui sont le produit « de l'action et de la vie. Fruit de l'expérience pratique, elles sont nées du contact direct avec les forces naturelles d'abord, avec ses semblables ensuite ». L. G.

Clements, Forrest Edward. Primitive concepts of disease. (*University of California Publications in American Archaeology and Ethnology*, 32, no. 2.) Berkeley, University of California Press, 1932. ISIS

Lehner, Stephan. Geister- und Seelenglaube der Bukaus und anderer Eingeborenenstämme im Huongolf Nord- Neu-Guineas. 44 p. (*Mitteilgn. aus d. Mus. f. Völkerkde.* in Hamburg. XIV.) Hamburg, FRIEDERICHSEN, DE GRUYTER, 1930. ISIS

Reviewed by HANS DAMM, *DLZ*, 3, 325-27, 1932.

Mead, Margaret. Growing up in New Guinea : a comparative study of primitive education. XI+285 p., 16 pl. London, ROUTLEDGE, 1931. ISIS

Reviewed in *Nature*, 130, 78, 1932.

Rasmussen, Knud. Intellectual culture of the Iglulik Eskimos. 308 p., ills. Report of the Fifth Thule Expedition 1921-24, vol. 7, no. 1, Copenhagen, 1929. ISIS

Reviewed by WILLIAM THALBITZER, *Geographical Review*, 22, 509-10, 1932.

Saintyves, P. Les origines de la méthode comparative et la naissance du folklore. Des superstitions aux survivances. *Revue de l'Histoire des Religions*, 105, 44-70, 1932. ISIS

Thurnwald, Richard. Repräsentative Lebensbilder von Naturvölkern. XXIII+311 p., 12 pl., 12 fig. (*Die menschl. Gesellsch. in ihren ethnosoziolog. Grundlagen* v. R. THURNWALD. Bd. I.) Berlin, DE GRUYTER, 1931. ISIS

Reviewed by S. R. STEINMETZ, *DLZ*, 3, 1329-34, 1932.

41. — SUPERSTITION AND OCCULTISM

Graf, Arturo. The story of the devil. Translated from the Italian

by EDWARD NOBLE STONE, with notes by the translator. XIV+396 p. London, MACMILLAN, 1931. ISIS

Regnault, Félix. Les superstitions médicales aux environs de Paris. *La Nature*, n° 2856, 406-09, 1931. ISIS

Reviewed in *Bulletin de la Société française d'Histoire de la Médecine*, 26, 71-72, 1932.

Rudwin, Maximilian. The devil in legend and literature. XIV+354 p. Chicago, Open Court, 1931. ISIS

Reviewed by LYNN THORNDIKE, *Isis*, 18, 208, 1932; by BERNDT GÖTZ, *DLZ*, 3, 710-14, 1932.

43. — SOCIOLOGY, JURISPRUDENCE, AND POSITIVE POLITY

Bab, Julius. Das Theater im Lichte der Soziologie. In den Grundlinien dargestellt. XVIII+227 p. (*Zeitfragen aus d. Gebiete d. Soziol.* 4. Reihe : Beiträge z. Soziol. d. Kunst. H. 1.) Leipzig, HIRSCHFELD, 1931. ISIS

Reviewed by K. K. EBERLEIN, *DLZ*, 3, 1366-68, 1932.

Landman, Jacob Henry. Human sterilization : the history of the sexual sterilization movement. XVIII+341 p. New York, MACMILLAN, 1932. ISIS

Mogi, Sobei. The problem of federalism : a study in the history of political theory. With a preface by HAROLD J. LASKI. Two volumes. 1144 p. New York, MACMILLAN, 1931. ISIS

Reviewed by WILLIAM B. MUNRO, *American Historical Review*, 37, 742-43, 1932.

Moïssides, M. Le malthusianisme dans l'antiquité grecque (Contribution à l'histoire du malthusianisme). *Janus*, 36, 169-79, 1932. ISIS

Le problème posé par MALTHUS avait déjà préoccupé les législateurs, philosophes et médecins de la Grèce antique; ils en avaient étudié les conséquences sociales, économiques, politiques et eugéniques. L. S.

Neurath, Otto. Empirische Soziologie. Der wissenschaftliche Gehalt der Geschichte und Nationalökonomie. 151 p. (*Schriften z. wissensch. Weltauffassung*. Hrsg. v. PH. FRANK u. M. SCHLICK. Bd. 5). Berlin, SPRINGER, 1931. ISIS

Reviewed by FR. EULENBURG, *DLZ*, 3, 422-26, 1932.

Ruggiero, Guido de. Geschichte des Liberalismus in Europa. Deutsch von K. WALDER u. K. WANDEL. 458 p. München, Drei Masken Verl., 1930. ISIS

Reviewed by ADALBERT WAHL, *DLZ*, 3, 1284-86, 1932.

Wells, Herbert George. The work, wealth and happiness of mankind. 2 vols. XIII+850 p., 32 pl. London, HEINEMANN, 1932. ISIS

Reviewed in *Nature*, 129, 558-60, 1932.

44. — HISTORY OF CIVILIZATION

(General history, historical methods, biography and chronology)

Breasted, James H. The rise of man. *Science*, 74, 639-44, 1931. ISIS

Dawson, Christopher. The making of Europe. An introduction to the history of European unity. XXIV+317 p., illus., 4 maps. London, SHEED & WARD, 1932. ISIS

Brilliant synthesis of the period extending from the fall of the Roman Empire to the Norman conquest with special emphasis on ecclesiastical history. The author has succeeded in showing the fundamental importance of the cultural achievements of that time, the so-called Dark Ages. " Our difficulty in understanding and appreciating that age is due in part to the creative nature of its activity. It was an internal organic process which did not manifest itself in striking external achievements, and consequently it lacks the superficial attractiveness of periods of brilliant cultural expansion, like that of the Renaissance or the Augustan Age..." " The foundations of Europe were laid in fear and weakness and suffering—in such suffering as we can hardly conceive to-day even after the disasters of the last eighteen years. And yet the sense of despair and unlimited impotence and abandonment that the disasters of the time provoked was not inconsistent with a spirit of courage and self-devotion which inspired men to heroic effort and superhuman activity." The author's message is beautifully illustrated with sixteen well selected plates and four maps. G. S.

Ewen, Cecil Henry L'Estrange. A history of surnames of the British Isles : a concise account of their origin, evolution, etymology, and legal status. XX+508 p. New York, MACMILLAN, 1931. ISIS

Reviewed by RAMONA BRESSIE, *American Historical Review*, 37, 733-35, 1932.

(Historical sciences). Enquêtes concernant les archives et la chronologie. *Bulletin of the International Committee of Historical Sciences*, 4, 179-356, 1932. ISIS

Keyser, Erich. Die Geschichtswissenschaft. Aufbau und Aufgaben. V+243 p. München, OLDENBOURG, 1931. ISIS

Reviewed by RUDOLF STADELMANN, *DLZ*, 3, 464-68, 1932.

Lhéritier, Michel. L'histoire du point de vue international. *Le Livre*, vol. 5, no. 8, 1-5, 1931. ISIS

Means, Philip Ainsworth. Fall of the Inca Empire and the Spanish rule in Peru : 1530-1780. XII+351 p., 29 illus., 1 map. New York, SCRIBNERS, 1932 ($ 4.50). ISIS

The first volume of MEANS' great work *Ancient civilizations of the Andes* (1931) was the subject of an elaborate review in *Isis*, 16, 465-68. The second volume tells the story of the Andean area from 1530 to 1780. Only a brief chapter deals with intellectual life, and only 4 pages of it, " The sciences ", are of immediate concern to us. Indeed there was but very little to say of scientific progress in that age and region. The Inquisition was very active, and the main controversy agitating the elite turned upon the question of whether or not the Indians were rational beings with rights which should be respected. The Indians' best friend was the good bishop BARTOLOMÉ DE LAS CASAS (*Isis*, 13, 442). The University of San Marcos, founded in 1551 as a Dominican school, was soon secularized but hardly liberalized. The two greatest scientists of the viceregal period were two Jesuits, JOSÉ DE ACOSTA (in Peru from 1569 to 1583) and BERNABÉ COBO (in Peru, 1599-1657),—historians and naturalists. It is well known that in order to accomplish the Gregorian reform in Europe, the morrow of Oct. 4, 1583 was called Oct. 15; it is less known that in the New World the same days were only omitted in the following year 1584. The circulation of the blood was not recognized in Peru until 1723. Two other naturalists flourished in the eighteenth century, COSME BUENO and JOSÉ EUSEBIO DE LLANO ZAPATA. The Jesuits were expelled in 1767.

The combined index and glossary (p. 329-51), containing definitions of Quechua and Spanish terms is an excellent innovation. It could be still improved by adding the dates of birth and death of persons quoted.

G. S.

45. — HISTORY OF ART

(Art and science. Iconography. Arts and crafts)

Clark, Kenneth. The Gothic revival. An essay in the history of taste. XVI+308 p., 20 fig. London, CONSTABLE, 1928. ISIS

Reviewed by HELMUT PAPAJEWSKI, *DLZ*, 3, 840-44, 1932.

Kelly, Francis Michael ; Schwabe, Randolph. A short history of costume and armour chiefly in England (1066-1800). 2 vols. London, BATSFORD, 1931. ISIS

Reviewed by M. CALBERG, *Bulletin des Musées Royaux d'Art et d'Histoire*, 4, 79-80, 1932.

Naumann, Emil (1827-1888). Allgemeine Musikgeschichte. Neu bearbeitet und bis in die Gegenwart fortgeführt von ALFRED LOEVEN.

866 p., 69 fig., illus. Berlin, Eingenbrodler-Verl., 1927. ISIS
Reviewed by HELMUT SCHULTZ, *DLZ*, 3, 1180-82, 1932.

Schering, A. Aufführungspraxis alter Musik. 184 p. Leipzig, QUELLE & MEYER, 1932. ISIS

46. — HISTORY OF LANGUAGE, WRITING AND LITERATURE

Jaeschke, Kurt. Beiträge zur Frage des Wortschwundes im Englischen. 103 p. (*Sprache u. Kultur d. german. u. roman. Völker*. A : Anglist. Reihe, Bd. VI). Breslau, PRIEBATSCH, 1931. ISIS
Reviewed by W. FISCHER, *DLZ*, 3, 981-85, 1932.

Kieckers, Ernst. Die Sprachstämme der Erde. Mit einer Anzahl grammatischer Skizzen. XII+257 p. (*Kultur u. Sprache*, Bd. 7). Heidelberg, WINTER, 1931. ISIS
Reviewed by ERNST LEWY, *DLZ*, 3, 534-37, 1932.

Kuhn, Walter. Die jungen deutschen Sprachinseln in Galizien. Ein Beitrag zur Methode der Sprachinselforschung. Mit e. Vorwort v. EDUARD WINTER. XI+244 p., 28 fig., 5 maps. (*Deutschtum u. Ausland. Stud. z. Auslanddeutschtum u. z. Auslandkultur*. Hrsg. v. GEORG SCHREIBER. H. 26-27.) Münster, i. W., ASCHENDORFF, 1930. ISIS
Reviewed by KONRAD SCHÜNEMANN, *DLZ*, 3, 603-05, 1932.

Marouzeau, J. Lexique de la terminologie grammaticale et linguistique. IV+182 p. Paris, GEUTHNER, 1932. ISIS

Ogden, Charles Kay. The basic dictionary : being the 7500 most useful words with their equivalents in basic English ; for the use of translators, teachers and students. XX+106 p. Basic English : a general introduction with rules and grammar. 95 p. (Psyche miniatures : general series, no. 29). The basic vocabulary : a statistical analysis with special reference to substitution and translation. 96 p. (Psyche miniatures : general series no. 31). Basic English applied (science). With specimen translations in chemistry, physics and biology, by R. MICHAELIS. 88 p. (Psyche miniatures : general series no. 33). Debabelization : with a survey of contemporary opinion on the problem of a universal language. 171 p. (Psyche miniatures : general series no. 36). London, KEGAN PAUL, 1930. ISIS

Sandfeld, Kr. Linguistique balkanique. Problèmes et résultats.

242 p. (*Collect. Linguist.*, publ. par la Soc. de Linguist. de Paris, XXXI.) Paris, CHAMPION, 1930. ISIS

Reviewed by M. FRIEDWAGNER, *DLZ*, 3, 1172-76, 1932.

Tucker, Thomas George. A concise etymological dictionary of Latin. XXXI+307 p. Halle, NIEMEYER, 1931. ISIS

Reviewed by J. B. HOFMANN, *DLZ*, 3, 1069-71, 1932.

48. — HISTORY OF PHILOSOPHY

(*See also above*, 18. *Philosophy of science*)

Dewey, John. Philosophy and civilization. VII+334 p. New York, MINTON, BALCH, 1931. ISIS

Reviewed by F. S. MARVIN, *Nature*, 129, 329-31, 1932.

Grunicke, Lucia. Der Begriff der Tatsache in der positivistischen Philosophie des 19. Jahrhunderts. 199 p. Halle a.S., NIEMEYER, 1930. ISIS

Reviewed by ERNST v. ASTER, *DLZ*, 3, 825-27, 1932.

Jaspers, Karl. Die geistige Situation der Zeit. 3. Aufl. 191 p. (*Sammlung Göschen*, Band 1000). Berlin, DE GRUYTER, 1932. ISIS

Muirhead, John Henry. The Platonic tradition in Anglo-Saxon philosophy. Studies in the history of idealism in England and America. 446 p. London, ALLEN & UNWIN, 1931. ISIS

Reviewed by A. E. TAYLOR, *DLZ*, 3, 1118-22, 1932.

Stenzel, Julius. Metaphysik des Altertums (*Handbuch der Philosophie* hrsg. v. A. BÄUMLER u. M. SCHRÖTER). 196 p. Munich, OLDENBOURG, 1931. ISIS

Theiler, Willy. Die Vorbereitung des Neuplatonismus. X+166 p. (*Problemata*. Forschgn. z. klass. Philol. H. 1.) Berlin, WEIDMANN, 1930. ISIS

Reviewed by PAUL OSKAR KRISTELLER, *DLZ*, 3, 438-45, 1932.

49. — HISTORY OF RELIGION

(*Religion and science*)

Clemen, Carl. Religionsgeschichte Europas. Zweiter Bd. Die noch bestehenden Religionen. VI+335 p. Heidelberg, WINTER, 1931. ISIS

First volume, 1926. Reviewed by F. A. CHRISTIE, *American Historical Review*, 37, 582-83, 1932.

Drawbridge, Cyprian Leycester. The religion of scientists : being recent opinions expressed by two hundred Fellows of the Royal Society on the subject of religion and theology. Edited by C. L. DRAWBRIDGE, on behalf of the Christian Evidence Society. 160 p. London, BENN, 1932. ISIS

Harnack, Adolf von. Studien zur Geschichte des Neuen Testaments und der alten Kirche. I : Zur neutestamentlichen Textkritik. IX+256 p. (*Arbeiten z. Kirchengesch.* Hrsg. v. E. HIRSCH u. H. LIETZMANN, Bd. 19). Berlin, DE GRUYTER, 1931. ISIS

Reviewed by H. v. SODEN, *DLZ*, 3, 913-17, 1932.

Huxley, Julian (and others). Science and religion. A symposium. 175 p. London, HOWE, 1931 (3 s. 6 d.). ISIS

Excellent series of essays contributed by a galaxy of thinkers representing many different points of view : JULIAN JUXLEY, Sir J. ARTHUR THOMSON, J. S. HALDANE, the Right Rev. E. W. BARNES, bishop of Birmingham, BRONISLAW MALINOWSKI, the Rev. H. R. L. SHEPPARD, rector of St. Martin in the Fields and Dean of Canterbury, Canon B. H. STREETER, Rev. C. W. O'HARA, S. J., Sir ARTHUR EDDINGTON, Prof. S. ALEXANDER, the Dean of St. Paul's (Dean INGE), Dr. L. P. JACKS. These essays were broadcasted between September and December 1930. They are a credit to the British Broadcasting Corporation and to the English wireless audience. G. S.

Loisy, Alfred. Mémoires pour servir à l'histoire religieuse de notre temps. 3 vols. : vol. 1 (1857-1900) ; vol. 2 (1900-1908) ; vol. 3 (1908-1927). 589+664+607 p. Paris, NOURRY, 1930-31. ISIS

Compte-rendu de CH. GUIGNEBERT, *R. historique*, 169, 90-115, 1932; de JEAN POIRIER, *Mercure de France*, 235, 545-69, 1932.

Mensching, Gustav. Die Idee der Sünde. Ihre Entwicklung in den Hochreligionen des Orients und Occidents. 112 p. Leipzig, HINRICHS, 1931. ISIS

Reviewed by CARL ANDERS SCHARBAU, *DLZ*, 3, 820-24, 1932.

Sweet, William Warren. The story of religions in America. VII+571 p. New York, HARPER, 1931. ISIS

Reviewed by W. M. GEWEHR, *American Historical Review*, 37, 349-50, 1932.

VII. MEDICINE

50. — HISTORY, ORGANIZATION, AND PHILOSOPHY OF MEDICINE

Barbillion, Dr. Note sur les relations médicales de la France et de l'Italie au XV^e^ et au XVI^e^ siècle. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 14-20, 1932. ISIS

Bragman, Louis J. A rhymed outline of medical history. *Medical Life*, 39, 1-54, ill., 1932. ISIS

"A portion of Dr. LOUIS J. BRAGMAN's rhymed outline of medical history appeared in *Hygeia*, the health magazine published by the American Medical Association. The complete manuscript is now published for the first time. The illustrations and captions were furnished by the editor."

Camac, Charles Nicoll Bancker. IMHOTEP to HARVEY : backgrounds of medical history. Foreword by HENRY FAIRFIELD OSBORN. XXV+ 324 p., 4 illus. New York, HOEBER, 1931. ISIS

Castiglioni, Arturo. Italian medicine. The sixth volume in the *Clio Medica* series. XI+134 p., frontispiece, 10 illus. New York, HOEBER, 1932 ($ 1.50). ISIS

In eight crisp chapters Professor CASTIGLIONI reveals with crystal clarity the history of medicine in Italy. Beginning with EMPEDOCLES OF AGRIGENTUM five centuries before Christ, he unfolds the development of man's political and economic philosophy and correlates it with the ever enlarging art and science of medicine.

The soil that gave birth to the Roman Empire, the Renaissance, and Fascism also gave to medicine its most brilliant pioneers. True Italian medicine began in the ninth century with the founding of the School of Salerno. A path emblazoned with success reveals the names of LEONARDO, BERENGARIO, CANANO, VESALIUS, FALLOPPIO, the anatomists; COLOMBO, CESALPINO, FABRICIUS, SPALLANZANI, the physiologists; and BENIVIENI, MALPIGHI, MORGAGNI, the pathologists.

The BORGOGNONI used anesthesia for operations in the thirteenth century. This century saw the foundations of hygiene and the quarantine firmly established. In the sixteenth century, FRACASTORO founded epidemiology and TAGLIACOZZI established the science of plastic surgery. In the seventeenth century, legal medicine, industrial hygiene, and the scientific academies, Lincei, and Cimento, were introduced. The following centuries are marked by no less important events. The nineteenth century worthies, too little known outside of Italy, are reviewed in detail in this surprisingly complete primer.

The illustrations are well chosen, and there is a good index. S. P. L.

Comrie, John D. History of Scottish medicine. Published for the

Wellcome Historical Medical Museum. Second edition. Vol. 1. 400 p. Vol. 2. p. 401-852. London, BAILLIÈRE, TINDALL and COX, 1932. ISIS

Reviewed in *Nature*, 129, 812-13, 1932.

Dauphin, V. Les anciennes corporations d'Angers, les chirurgiens. *Mém. de la Soc. d'Agriculture, Sciences et Arts d'Angers*, 5, 5-49, 1930. ISIS

Reviewed in *Bulletin de la Société française d'Histoire de la Médecine*, 26, 72-73, 1932.

Ewing, James. The university and the medical profession. *Science*, 75, 173-81, 1932. ISIS

Haggard, Howard Wilcox. Devils, drugs and doctors; the story of the science of healing from medicine-man to doctor. XXII+405 p., 16 pl. London, HEINEMANN, 1931. ISIS

Packard, Francis Randolph. History of medicine in the United States. New edition. 2 vols. 1323 p., 103 illus. New York, HOEBER, 1931. ISIS

Reviewed by F. H. GARRISON, *Annals of Medical History*, 4, 104-05, 1932.

Patten, Nathan Van. The medical literature of Guatemala. *Ann. Med. Hist.*, 4, 91-100, 2 fig., 1932. ISIS

The first Guatemalan medical publication was a widely translated and circulated pamphlet by José FLORES (1751-1796?): Especifico nuevamente descubierto en el Reyno do Guatemala para la curación radical del horrible mal de cancro, Guatemala City, 1782. It treated of the virtues of the lizards of San Cristoval, which on being eaten raw caused a fever and were in consequence reputed to cure "ulcers and buboes" (syphilis? and cancer?). Dr. VAN PATTEN offers an English translation and bibliographical commentary. Dr. VAN PATTEN also presents a valuable discussion of the work of the Guatemala City, 1798. There is no evidence that ESPARRAGOSA knew of the instrument probably devised by PETER CHAMBERLEN (1601-1683) and kept secret for commercial exploitation by himself and his heirs. ESPARRAGOSA also published in 1815 an important paper urging the use of Jennerian vaccination if the ravages of smallpox were to be overcome. C. D. L.

Riesman, David. The art of medicine. *Science*, 74, 373-80, 1931. ISIS

Sigerist, Henry E. Die ärztliche Kosmetik im Wandel der Jahrhunderte. *Die Medizinische Welt*, 20 p., 1931. ISIS

Sigerist, Henry E. Der Arzt und die Umwelt. *Deutsche Medizinische Wochenschrift*, 7 p., 1931. ISIS

Sigerist, Henry E. Grosse Ärzte : eine Geschichte der Heilkunde in Lebensbildern. 310 p., 68 fig. München, LEHMANN, 1932 ISIS

Excellent popularized account of leading physicians since antiquity. Well illustrated and blessed with a short but stimulating bibliography. It might have added a little to the international completeness of the volume if some leading recent contributors to medicine were noted from regions other than Germany, France, and England. But this is a matter of taste. C. D. L.

51 — EPIDEMIOLOGY, HISTORY OF SPECIAL DISEASES, PUBLIC HEALTH, AND SOCIAL MEDICINE

Darmstaedter, Ernst. Kritisch-historische Bemerkungen über " Selbstverbrennung des menschlichen Körpers." *Deutsche Zeitschrift für die gesamte gerichtliche Medizin*, 18, 437-45, 1932. ISIS

Delassus, A. Progrès des connaissances médicales sur la tuberculose pulmonaire. *R. des questions scientifiques*, 21, 329-60, 1932. ISIS

Hume, Edgar Erskine. The United States Army Medical Department and its relation to public health. *Science*, 74, 465-76, 1931. ISIS

Legiardi-Laura, C. LOMBROSO and FREUD. The puzzle Lombroso left unsolved. *Medical Life*, 39, 109-21, portr., 1932. ISIS

Little, E. Muirhead. History of the recognition of tuberculosis as a factor in bone and joint surgery. *Proc. Roy. Soc. Med.*, 25, 627-38, 1932. ISIS

Neveu, R. Prophylaxie et traitement de la peste dans les états barbaresques au XVII^{e} et XVIII^{e} siècles. *Progrès médical*, n^{o} 27, 1221-28, 1931. ISIS

Reviewed in *Bulletin de la Société française d'Histoire de la Médecine*, 26, 76-77, 1932.

Nieuwenhuis, G. Einige Anschauungen über die Funktion der Hypophyse. *Janus*, 35, 345-59, 1931. ISIS

Pearl, Raymond. Alcool e biologia umana. *Scritti biologici*, 6, 12 p., 1931. ISIS

Piéry, M.; Roshem, J. Histoire de la tuberculose. XVI+479 p., 77 fig., Paris, DOIN, 1931. ISIS

Le livre I (pp. 1-125) de l'ouvrage de M. PIERY et J. ROSHEM (†) est consacré à l'étude de l'évolution des idées sur la tuberculose, à l'histoire des grandes étapes de cette maladie, surtout dans ses liaisons avec les doctrines médicales de chaque époque. C'est la partie de l'ouvrage qui intéressera le plus les historiens de la médecine. Dans le livre deuxième (pp. 128-314) : Histoire analytique des grands problèmes de la tuberculose, apparaît la genèse des idées sur l'étiologie et la pathogénie de la tuberculose, sur la contagion, l'hérédité, la prophylaxie, l'anatomie pathologique de la phtysie, sa description clinique et son diagnostic. Enfin, le livre III (315-415) est consacré à l'histoire de la phtysiothérapie. Nombreux portraits, bibliographie de 38 pp. (un peu « trompe-l'œil », les auteurs semblent très peu au courant de tout ce qui n'est pas écrit en langue française), index. L. G.

Raaf, John E. Hernia healers. *Ann. Med. Hist.*, 4, 377-89, 1932. ISIS

Schapiro, D. La péritomie. *Janus*, 35, 221-48, 1931. ISIS

Walsh, James J. Some chapters in the history of care for the insane. *Medical Life*, 39, 208-20, 1932. ISIS

52. — HISTORY OF HOSPITALS AND MEDICAL TEACHING

Gidon, F. Le tome I des thèses de l'ancienne faculté de médecine de Caen, 1659-1740. *Bulletin de la Société française d'Histoire de la Médecine*, 26, 21-49, 1932. ISIS

Hellinga, G. De Amsterdamsche gasthuizen beoordeeld door vreemdelingen. *Bijdragen tot de geschiedenis der geneeskunde*, 12, 105-19, 1932. ISIS

Posey, William Campbell ; Brown, Samuel Horton. The Wills Hospital of Philadelphia, the influence of European and British ophthalmology upon it and the part it played in the last 100 years in developing ophthalmology in America. x+340 p., illus., pl., ports., Philadelphia, LIPPINCOTT, 1931. ISIS

Reviewed in *Annals of Medical History*, 4, 105-07, 1932.

Sigerist, Henry E. Bericht über die Tätigkeit des Instituts fur Geschichte der Medizin an der Univ. Leipzig in den Jahren 1929-31. *Kyklos*, 4, 81-88, 1932. ISIS

Tovell, Harold M. Notes on the medical history of Bruges and the Hospital of St. John. *Ann. Med. Hist.*, 4, 398-409, 3 figs., 1932. ISIS

Zembrzuski, L. L'enseignement de l'histoire de la médecine en

Pologne. *Bulletin de la Société française d'Histoire de la Médecine*, 25, 471-86, 1931. ISIS

53 — PHARMACY. PHARMACOLOGY. TOXICOLOGY

Barger, George. Ergot and ergotism : a monograph based on the Dohme lectures delivered in Johns Hopkins University, Baltimore. XVI+279 p., 6 pl. London, GURNEY and JACKSON, 1931. ISIS

Reviewed in *Nature*, 129, 335-36, 1932.

Darmstaedter, Ernst. Aus der Geschichte des Jods und der Jodtherapie. *Schweizerische Medizinische Wochenschrift*, 62, 98-100, 1932. ISIS

Darmstaedter, Ernst. Der Schierlingsbecher. *Medizinische Welt*, 5, 4 p., 1931. ISIS

Darmstaedter, Ernst. Spongia somnifera, ein Beitrag zur Geschichte der Anaesthesie. *Atti dell' VIII Congresso Internazionale di Storia della Medicina*, 7 p., 1931. ISIS

Escaich, Auguste; Lorgeau. Une vieille pharmacopée siamoise inédite. *R. d'hist. de la pharmacie*, n° 78, 96-112, 1932. ISIS

Première partie de la traduction d'un formulaire siamois contre les fièvres, copié en 1815 par un médecin inconnu, sur un document que rien ne permet de dater. La plupart des produits désignés ont pu être identifiés par ESCAICH. Cette pharmacopée indo-chinoise semble assez proche parente de nos pharmacopées du moyen âge. L. G.

Leclerc, Henri. Histoire thérapeutique du cresson. *Janus*, 35, 313-34, 1931. ISIS

Dès les temps les plus reculés, l'odeur et la saveur du cresson lui valurent une place à part comme condiment et comme médicament, principalement comme antiscorbutique. L. S.

Stockman, Ralph. Historical notes on poisoning by leguminous foods. *Janus*, 36, 180-89, 1932. ISIS

VIII. EDUCATION

(The methods of accumulating, imparting and diffusing knowledge)

55. — ACADEMIES, SOCIETIES, CONGRESSES. NATIONAL AND INTERNATIONAL ORGANIZATION OF SCIENCE

(Societies and congresses devoted to particular sciences are classified under those sciences. For the internal organization of science — Isis, I, 195 — see section 17)

Lacroix, Alfred. Les membres et correspondants de l'Académie royale des Sciences (1666-1793). XVI+265 p. Paris, Palais de l'Institut, 1931. ISIS

Sparn, Enrique. Las sociedades científicas literarias y tecnicas del mundo con mas de 1000 miembros. 76 p. (*Republica Argentina. Academia nacional de ciencias. Miscelanea* nº 18). Cordoba, 1931. ISIS

Reviewed by H. D., *Journal des Savants*, 140-41, 1932.

56. — BIBLIOGRAPHY

(Methods, libraries)

(British Museum). General catalogue of printed books. Vol. 1 : A—Aeg. Vol. 2 : Aegi-Aleu. VI p., 1004 col. ; 996 col. London, CLOWES, 1931-32. ISIS

Reviewed by HERMANN FUCHS, *DLZ*, 3, 385-90, 1932.

Dutcher, George Matthew ; Shipman, Henry Robinson ; Fay, Sidney Bradshaw ; Shearer, Augustus Hunt ; Allison, William Henry. A guide to historical literature. XXVIII+1222 p. New York, MACMILLAN, 1931. ISIS

Reviewed by GODFREY DAVIES, *American Historical Review*, 37, 290-96, 1932.

Hoecker, Rudolf ; Vorstius, Joris. Internationale Bibliographie des Buch- und Bibliothekswesens mit besonderer Berücksichtigung der Bibliographie. Jg. IV, 1929 : VIII+199 p. ; Jg. V, 1930 : XI+224 p. Leipzig, HARRASSOWITZ, 1930-1931. ISIS

Reviewed by ROBERT TEICHL, *DLZ*, 3, 865-67, 1932.

Hombert, Marcel. Projets de bibliographie papyrologique. *Chronique d'Egypte*, 7, 227-36, 1932. ISIS

MacNair, Mary Wilson. A list of American doctoral dissertations printed in 1930. VII+342 p. Washington, D.C., Library of Congress, 1932. ISIS

Klose, Olaf. Islandkatalog der Universitätsbibliothek Kiel und der Universitäts- und Stadtbibliothek Köln, hrsg. v. d. Univ.-Bibl. Kiel. XII+423 p. (Kataloge d. Univ.-Bibl. Kiel, hrsg. v. CHRISTOPH WEBER. 1.) Kiel, Univ.-Bibl., 1931. ISIS

Reviewed by ANDREAS HEUSLER, *DLZ*, 3, 928-29, 1932.

(Leidinger, Georg). Festschrift für GEORG LEIDINGER zum 60. Geburtstag am 30. Dezember 1930. Edited by ALBERT HARTMANN. XIV+324 p., 35 pl. München, SCHMIDT, 1930. ISIS

Reviewed by ALOYS BÖMER, *DLZ*, 3, 1345-48, 1932.

Weinberger, Wilhelm. Wegweiser durch die Sammlungen altphilologischer Handschriften. 136 p. (*Sitzungsber. d. Akad. d. Wiss. in Wien*. Philos.-hist. Kl., 209. Bd., 4. Abh.) Wien, Hölder-Pichler-Tempsky, 1930. ISIS

Reviewed by CARL WEYMAN, *DLZ*, 3, 782-85, 1932.

57. — MUSEOLOGY

(*Museums and collections*)

Adams, Charles C. Twenty-fourth report of the director of the Division of science and the State Museum. *New York State Museum Bulletin*, no. 288, 124 p., 42 fig., 1931. ISIS

Grancsay, Stephen V. An exhibition of forgeries. *Bulletin of the Metropolitan Museum of Art*, 27, 46-48, 1 fig., 1932. ISIS

"The purpose of the exhibition is educational. In placing its collection of forgeries in close proximity to authentic material of a similar kind, the Museum offers the student a splendid opportunity to train his eye and to improve his taste, and this training is the more essential as greater trouble has been taken to deceive than to detect deceit."

59. — ERRATA. Series 26.

(*For previous errata, see* Isis, XIX, 315)

Vol. 18, p. 345 : The note on AILLY ought to be placed in the preceding section.

Vol. 18, p. 401 : The note on CARDAN ought to be classified under XVIth century (whole and first half) A.

Vol. 18, p. 412, l. 2 : Read GASK, G. E. instead of Gash.

SARTON's *Introduction to the History of Science*, vol. II.

p. 206, l. 5 : Read twelfth instead of thirteenth.
p. 444 : Title of second note, read ḌABBĪ.
p. 603, l. 5 : Read GELZER.
p. 1117, l. 7 from bottom : Read Erivan, instead of Ervian.
p. 1176 : After GEORGE PACHYMERES, write XIII (2), 972.

A few other misprints are not mentioned in these errata because they are too obvious to cause any error or confusion. I wish to express my thankfulness to the readers who take the trouble to make the above-mentioned corrections in their set of *Isis* and the *Introduction*. I would advise them, after having accomplished that little task, to write their initials near mine at the bottom of this note in order to indicate that these and the previous errata have been taken into account. G. S.

These and the previous errata have been corrected by...

Index of Authors Included in the Thirty-sixth Bibliography

The Roman figures refer to centuries ; the Arabic figures, to the sections of Parts II and III, which are numbered consecutively from 1 to 59. This index will enable one to find more easily the papers analyzed in the present bibliography, and also to see at a glance what each writer is doing.

October 1932. FRANCES SIEGEL.

A

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